COMMONWEALTH MYCOLOGICAL INSTITUTE

REVIEW

OF

APPLIED MYCOLOGY

VOL. XXX MAY 1951

POEHLMAN (J. M.) & KINGSOLVER (C. H.). **Disease reaction and agronomic qualities of Oats selections from a Columbia × Victoria-Richland cross.**—*Agron. J.*, 42, 10, pp. 498–502, 1 fig., 1950.

At the Missouri Agricultural Experiment Station, 26 oat selections originating from a single F_5 plant Columbia × Victoria-Richland were studied for their reactions to *Helminthosporium victoriae* and *Puccinia coronata* [*R.A.M.*, 30, p. 151]. In greenhouse tests 12 selections were resistant, six segregating, and eight susceptible to *H. victoriae*. Plants resistant to Victoria blight were intermediate in their responses to races 1 and 45 of crown rust; the pustules were smaller and the amounts of rust less than on susceptible varieties, but the characteristic Victoria type of resistance was not shown.

In the field in 1947, with both diseases present in a severe form, the selections resistant to *H. victoriae* produced excellent yields of heavy grain, with little lodging, and were only moderately attacked by *P. coronata*. Segregating and susceptible strains were inferior in yield and test weight, more liable to lodging, and exhibited the characteristic Victoria type of resistance to crown rust of plants susceptible to Victoria blight. In the absence of heavy infection by either disease in 1948 the performance of the blight-resistant strains excelled that of Columbia, Clinton, and other standard varieties. Abundant yields were obtained in 1949 in the presence of races of *P. coronata* pathogenic to varieties of Bond origin.

Crown rust severity readings on four blight-resistant strains (04195, 04197, 04201, and 04205) grown in the field in seven States (Missouri, Arkansas, Iowa, Wisconsin, Virginia, New York, and Maryland) in 1949 substantiated previous observations as to the intermediate type of resistance to *P. coronata*. This reaction, combined with resistance to *H. victoriae*, races 2 and 5 of stem rust [*P. graminis*], and smut [*Ustilago avenae* and *U. kolleri*] should make the above-mentioned strains potentially useful as varieties in the southern spring-sown oat area.

Fifth Hybrid Seed Corn Industry Research Conference.—*Seed World*, 67, 12, pp. 8, 10, 44–45, 1950.

At the Fifth Hybrid Seed Corn Industry Research Conference of the Hybrid Seed Corn Division held in Chicago from 28th to 29th November, 1950, Dr. A. J. ULLSTRUP of the United States Department of Agriculture and Purdue University, Indiana, stated that the severity of leaf diseases of maize appeared to coincide with the increase in hybrid maize, a number of susceptible varieties having been released during recent years, and the occurrence of conditions favourable to the spread of these diseases. The leaf blight group comprises northern leaf blight [*Helminthosporium turcicum*: see next abstract], breeding for resistance to which involves several complex problems; southern leaf blight [*Cochliobolus heterostrophus*: *R.A.M.*, 29, p. 299; 30, p. 224], which is prevalent south of the Ohio River and east of the Mississippi; Stewart's disease [*Xanthomonas stewarti*], which attacks

chiefly sweet and flint corn; and *Helminthosporium* leaf spot [*H. carbonum*: ibid., 26, p. 448; 29, p. 361]. Stalk and ear rots [caused by various fungi] were dealt with by Dr. B. KOEHLER.

STONER (W. N.). **A preliminary report of results from some fungicide spray trials for control of Helminthosporium leaf blight of Sweet Corn.**—*Plant Dis. Reptr*, 34, 10, pp. 312–313, 1950. [Multilithed.]

Sweet corn has become an increasingly important winter and spring crop in Florida, but large-scale production is threatened by the occurrence of leaf stripe (*Helminthosporium turcicum*) [*R.A.M.*, 29, p. 361 and preceding abstract]. In the spring and early summer of 1950 spraying tests were conducted on trial plots at the Everglades Experiment Station, starting when the symptoms became apparent on the lower leaves of the plants. Eleven applications were given at three-day intervals (except for extra sprays after each rain). The plots were rated when spraying was terminated at the tasselling stage and again at harvest; at both times dry parzate (2 lb. per 100 gals.) was rated best and gave an average comparative yield weight (untreated =1) of 3·76, followed by SR-406 (N-trichloromethylthio-tetrahydrophthalimide: 4 lb. wettable powder per 100 gals.) 3·16.

PERKINS (D. D.). **Biochemical mutants in the smut fungus Ustilago maydis.**—*Genetics*, 34, 5, pp. 607–626, 2 figs., 6 graphs, 1 diag., 1949.

In work at Columbia University, New York, stable biochemical mutants have been obtained by ultraviolet irradiation of *Ustilago maydis*. Fifteen isolates requiring specific B-vitamins, amino acids, nucleic acid components, or a source of reduced sulphur are described. An auxanographic method was used for detecting and identifying growth factor requirements in the mutants. All possible recombinations of mutant factors were recovered from crosses involving two and three loci at a time.

HANSING (E. D.), MELCHERS (L. E.), & BATES (J. C.). **Weak neck of Sorghum.**—*Agron. J.*, 42, 9, pp. 437–441, 2 figs., 1950.

The results of a study at the Kansas Agricultural Experiment Station on the symptomatology and etiology of weak neck of sorghum [*R.A.M.*, 22, p. 429] are reported. Characteristics of this physiological disorder are the gradual disintegration of the peduncle tissues, which often break at or near their bases, and poorly developed, lustreless grain. The condition was induced in the susceptible Colby variety by subjecting the plants to one or more 'drought stress periods' (lowering the moisture content of the soil) during the growing season, by artificial partial or total defoliation, or by partial shading of the leaves. The resistant Pink kafir and White Yolo varieties maintained a higher concentration of carbohydrates in the peduncles throughout the growing season than did the susceptible Colby and Day. Control may probably best be effected by breeding combine varieties with inherent peduncle characters of the kafir type.

CHILDS (J. F. L.). **The cachexia disease of Orlando Tangelo.**—*Plant Dis. Reptr*, 34, 10, pp. 295–298, 6 figs., 1950. [Multilithed.]

The cachexia disease of Orlando tangelos, possibly of virus origin, was first observed in 1945 in a planting near Clearwater, Florida. Subsequently it was reported from various localities, affecting Orlando on sour orange, sweet orange, Rough lemon, Rusk citrange, Cleopatra mandarin, and grapefruit stocks. The incidence varied from 1 to 60 per cent.; in young plantings it averaged 25 per cent., while in many older plantings it appeared to be absent. The symptoms, which include conspicuous vein chlorosis, phloem discoloration, stunting, cankering, and stem-pitting, are similar to those of grapefruit in South Africa [*R.A.M.*, 30, p. 99].

However, results of bud transmission experiments started in 1947 so far have proved negative. No spread from tree to tree has been observed, but there is some evidence that trees may be symptomless carriers. It is recommended that buds for propagation be obtained from healthy trees of seven or more years of age.

Hopkins (E. F.) & Loucks (K. W.). **Prevention of the phytotoxic action of sodium orthophenylphenate on Citrus fruits by hexamine.**—*Science*, 112, 2920, pp. 720–721, 1 fig., 1950.

Co-operative experiments carried out by the Florida Citrus Commission, Lakeland, and the Citrus Experiment Station, Lake Alfred, demonstrated that peel burn of citrus fruits caused by dip treatments with dowicide A (sodium *o*-phenylphenate) [*R.A.M.*, 19, p. 285; 28, p. 285] for the prevention of stem-end rot [*Diplodia natalensis*] and mould [*Penicillium digitatum* and *P. italicum*: loc. cit.] can be completely eliminated by adding hexamine, even with strong concentrations (3 per cent.) of fungicide. Under the same conditions, dipping oranges in dowicide A plus formaldehyde resulted in 100 per cent. of the fruit being badly burned. Data obtained from oranges stored for three weeks showed that the addition of hexamine to dowicide A did not interfere with its fungicidal action. In tests with 30,000 fruits, including Hamlin, Parson Brown, and Pineapple oranges and Dancy tangerines there was no failure to prevent peel burn. A two minute dip in a solution containing 2 per cent. dowicide A and 1 per cent. hexamine at 100° F. without subsequent rinsing is recommended.

Reinking (O. A.). **Preliminary report on the cadang-cadang disease and on soil deficiency troubles in the Philippines.**—*Plant Dis. Reptr*, 34, 10, pp. 300–304, 1950. [Multilithed.]

The destructive cadang-cadang disease of coco-nut [*R.A.M.*, 29, p. 558] is at present apparently confined to the Bicol region of the Philippines. Extensive surveys in May and June, 1950, in severely affected areas in Camarines Norte, Camarines Sur, Sorsogon, and Albay showed that the disease is most serious in the last two provinces, 90 to 100 per cent. infection being common there and in the Nato area of Camarines Sur and the Dalt region of Camarines Norte. On the San Miguel estate, Albay, the disease has spread and become more severe since 1947. Of 260,000 bearing trees planted mostly in 1924, only 116,000, many of which were diseased, were standing. Copra production in 1947 and 1950 was 260 and 55 tons, respectively. Seven- to eight-year-old trees, not yet in bearing, had no symptoms, but older bearing trees near by were badly affected. These preliminary studies would indicate that cadang-cadang may be infectious and either that infection takes place through the floral parts, or that the disease is latent in young trees; as no fungi or bacteria were isolated this also tends to substantiate a virus hypothesis [loc. cit.], but further investigations are necessary.

In certain areas of the Candelaria region, Quezon province, coco-nut palms suffer from a general lack of vitality, with marked flower and nut reduction, probably due to soil deficiency. The leaves are definitely yellow, and older leaves turn brown and die prematurely. In old cogon grass [*Imperata cylindrica*] areas the yellowing is generally intensified because of nitrogen deficiency, and young trees may be stunted. In one 50-year-old grove (free from cogon grass) the yields were reduced from 40,000 nuts per harvest in 1946 to 9,000 in 1950. The yields of two infested with cogon grass were reduced from 10,000 to 1,000, and 60,000 to 1,000.

Moreau (C.) & Moreau (Mireille). **Une trachéomycose des Caféiers en Côte d'Ivoire.** [A tracheomycosis of coffee shrubs in the Ivory Coast.]—*C. R. Acad. Sci., Paris*, 231, 25, pp. 1554–1556, 1950.

Peroneutypa multistromata n.sp. is the name proposed for a fungus collected,

together with numerous stromata of a *Eutypella*, on dead coffee branches (*Coffea canephora*) in the plantations at Issia, Ivory Coast. It is described [without a Latin diagnosis] as follows. The perithecia are deeply embedded singly or in groups of two or three in a common stroma. Each subglobose, ventricose, more or less flattened base, 270 to 450 by 200 to 300 μ, is surmounted by a neck, 400 to 900 μ in length, which forces its way through the host tissues and then through the erumpent stroma. The asci, lining the whole inner wall of the perithecium, are claviform, furnished with a long, slender pedicel, and measure 30 to 40 by 3 to 5 μ. They each contain eight allantoid, hyaline (light brown in the mass) ascospores, 3 to 4 by 0·75 to 1 μ. Stilbaceous coremia of the *Graphium* type, 400 to 700 μ in length, are occupied by numerous branched, septate hyphae, 2 μ in diameter, with a brown, thick wall.

The fungus is an important agent of tracheomycosis [see next abstract], its hyphae filling the vessels of the xylem and woody parenchyma, while the cells are completely obstructed by gummous tyloses, disposed in more or less regular bands and producing on the surface of the cortex corresponding zones of desiccation, sometimes very extensive.

Other fungi identified on specimens of coffee from the Ivory Coast included *Gibberella xylarioides* [cf. *R.A.M.*, 29, p. 618, and next abstract] and *Hypomyces haematococcus* with its var. *breviconus*.

Heim (R.) & Saccas (A.). **La trachéomycose des Coffea excelsa et robusta des plantations de l'Oubangui-Chari.** [Tracheomycosis of *Coffea excelsa* and *robusta* in the plantations of Oubangui-Chari.]—*C. R. Acad. Sci., Paris*, 231, 11, pp. 536–538, 1950.

Further information is given on the tracheomycosis of coffee caused by *Fusarium xylarioides* in the Belgian Congo [*R.A.M.*, 29, p. 617 and cf. preceding abstract]. *Coffea neo-arnoldiana* is equally susceptible with the cultivated varieties. Wild varieties of *C. excelsa* are reputedly resistant. The susceptibility of *C. robusta* was confirmed by the success of inoculation experiments giving 5 to 80 per cent. positive results.

C. excelsa may be attacked at any time from the cotyledonary stage to an advanced age, but the percentage of mortality is highest in bushes entering upon production. Numerous blue to blackish perithecia, resting on a well-developed hypocreaceous stroma and directly connected with the responsible *Fusarium* [loc. cit.], develop in the cortical fissures and on the collar, trunk, twigs, and very rarely on the roots. The disease progresses in an indefinite course which excludes all likelihood of infection through the soil. Spread is effected to the above-ground system by the aerial dissemination of the conidia and ascospores.

Observations and experiments show that the penetration of the fungus occurs through wounds. The site of penetration is generally marked by a fairly deep necrotic depression of the tissues of the level of the collar, and subsequently pink, violaceous, or blue to blackish patches develop in the tissues of the central cylinder.

The high degree of susceptibility of the cultivated varieties of *C. excelsa* is attributed, *inter alia*, to physiological imbalance, pruning, and cultural methods, but a more plausible explanation would seem to be afforded by the existence within the species of races or individuals with very different degrees of susceptibility to *F. xylarioides*.

The fungus isolated from the necrotic tissues of the above-mentioned species of coffee produces on various nutrient media concentric colonies, the mycelium on potato being white to yellowish with a black to violaceous centre shot with green, hyaline under the microscope, and furnished with (1) pionnotes; (2) unicellular, allantoid microconidia, with rounded tips, grouped in spurious heads united by mucus, 5 to 10 by 2·5 to 3 μ; (3) hyaline, falciform to fusoid macroconidia like those described by Steyaert [ibid., 26, p. 243; 28, p. 31]; and an abundance of

hyaline, mycelial and conidial, intercalary, lateral, or terminal, uni- or bicellular, smooth or echinulate chlamydospores, 10 to 15 by 8 to 10 μ. The ovoid, thick-walled perithecia, 200 to 400 by 180 to 300 μ, are blue-black with violaceous tints and enclose hyaline, thin-walled, cylindraceous, shortly pedicellate asci, 90 to 110 by 7 to 9·5 μ, containing a single row of eight faintly straw-coloured, fusoid, bicellular (rarely biseptate), ogival or prepuciform, exceedingly finely punctate or verrucose-catenulate ascospores, 12 to 14·5 (or up to 20) by 4 to 5 to 5·6 μ, which on germination give rise to the *Fusarium* state.

The highly specialized characters of the newly discovered ascigerous state of the agent of coffee tracheomycosis require its assignment to a new section, or rather an unpublished genetic division, of the Hypocreales, for which the name of *Carbuncularia* is proposed. It is close to *Gibberella* but differs in its uniseptate, finely punctate ascospores, aggregated perithecia, and xylarioid stroma.

Thompson (G. E.). **Variability of cultures of Ascochyta gossypii and its pathogenicity on Cotton seedlings.**—Abs. in *Phytopathology*, 40, 8, p. 791, 1950.

Cultures on potato dextrose agar of 575 single conidia isolated from single pycnidia of *Ascochyta gossypii* in different lesions on cotton leaves [*R.A.M.*, 30, p. 105] fell into many strains distinguishable by the colour and amount of aerial mycelium, growth rate, and presence or absence of fertile pycnidia. When selected strains were grown on different media the sporulating types usually produced conidia on all, though in varying abundance. The non-sporulating strains formed a few pycnidia and conidia on a medium consisting of 100 gm. dried ground cotton stems, 10 gm. agar, and 1,000 ml. distilled water. Some strains grew best at 20° C. and others at 25°. When sterilized soil was inoculated with conidial suspensions at the time of seed-sowing, lesions bearing fertile pycnidia developed at the stem bases and on the roots of the seedlings, and the fungus was re-isolated. Infected leaves, collected in the autumn and wintered out-of-doors in wire baskets, contained pycnidia with viable spores in the following June.

Drechsler (C.). **A Harposporium infecting Eelworms by means of externally adhering awl-shaped conidia.**—*J. Wash. Acad. Sci.*, 40, 12, pp. 405–409, 18 figs., 1950.

A description is given of *Harposporium subuliforme* n.sp. which destroyed all motile individuals of the eelworm *Rhabditis* sp. in decaying grass from Beltsville, Maryland, placed in old agar cultures in 1950. The colourless, awl-shaped, straight or curved conidia were rounded at the base and measured 12 to 26 μ long, proximally 1 to 1·8 μ wide, and distally 0·4 to 0·6 μ wide. They soon put forth obliquely from the tip an adhesive spur 2 to 5 μ long and about 0·6 μ wide.

Sackston (W. E.). **Effect of pasmo disease on seed yield and thousand kernel weight of Flax.**—*Canad. J. Res.*, Sect. C, 28, 5, pp. 493–512, 2 pl., 10 graphs, 1950.

In studies carried out in Western Canada on pasmo disease of flax (*Sphaerella linorum*) [*R.A.M.*, 29, pp. 80, 290, 496] satisfactory pycnidial formation to provide spore inoculum was obtained on potato dextrose agar containing ½ to 1 per cent. yeast extract. Satisfactory infection in field tests conducted at Morden and Winnipeg from 1945 to 1947 on the varieties Crystal, Viking, Royal, and Redwing was obtained by spraying at various stages of growth with spore suspensions in ¼ to 1 per cent. gelatin solution as spreader-sticker. The highest infection rates and the greatest reductions in seed yield and kernel weight in all years at both stations resulted from spray inoculations at the flowering stage, those on seedlings gave lower rates, and those on ripening plants the lowest, often negligible. Diluting the

spore concentration of the inoculum markedly reduced disease intensity, although it was significantly higher than that of uninoculated plants. Of the four varieties tested Crystal was least susceptible, followed in order by Royal, Redwing, and Viking. Heavy infections caused premature ripening and reduced the seed yield and thousand kernel weight of all varieties. Highly significant positive correlations between the data for seed yield and kernel weight indicated that much of the loss in yield results from reduction in the size of individual seeds.

DIMOCK (A. W.) & BAKER (K. F.). **Ethylene produced by diseased tissues injures cut flowers.**—*Flor. Rev.*, 106, 2754, pp. 27–29, 3 figs., 1950.

In tests carried out in May, 1948, at temperatures of 65° to 75° F., healthy, fully opened carnation flowers in water were sealed under a bell-jar with a vase of chrysanthemum blooms inoculated with the ray blight fungus (*Mycosphaerella ligulicola*) [*R.A.M.*, 29, pp. 154, 465] and also a few rotted petals. They developed distinct signs of 'sleepiness' after two days owing to the production of ethylene by the diseased plants [loc. cit.]. Carnations with inoculated chrysanthemums only and no rotted petals started to develop 'sleepiness' after three days, symptoms having appeared on the inoculated chrysanthemums after two days. Carnations sealed with healthy chrysanthemums remained fully open throughout the test.

Afterglow snapdragons [*Antirrhinum majus*] started to drop their flowers one day after enclosure with chrysanthemum blooms infected four days previously with *M. ligulicola*, and shedding was almost complete after three days. Blooms with healthy chrysanthemums or alone remained unaffected. The extreme sensitivity to ethylene gas of *Calceolaria* was demonstrated by the shedding of two-thirds of the flowers within 24 hours after a bell-jar, which had been used for about five days to cover infected chrysanthemums, had been placed about five feet away. This sensitivity was confirmed in tests similar to those described above and emphasizes the potential damage which might result if ethylene-producing diseased tissues are confined in sealed packages or in moderately large storage rooms with ethylene-sensitive plants. Fallen snapdragon flowers quickly became infected with *Botrytis* [loc. cit. and ibid., 30, p. 159]. This would increase ethylene production and accelerate further shedding, thus producing a 'chain reaction' effect.

MCCLELLAN (W. D.) & MARSHALL (B. H.). **Effect of temperature on the development of some diseases of Gladiolus, Narcissus, and Lilium.**—Abs. in *Phytopathology*, 40, 9, p. 872, 1950.

Optimum temperatures for the growth in culture of *Botrytis gladiolorum* [*R.A.M.*, 29, p. 307], *Curvularia lunata* [ibid., 28, p. 291], and *Stemphylium* sp., all from *Gladiolus*, were 65° to 75°, 75° to 85°, and 65° to 75° F., respectively. Infection of Picardy foliage with *B. gladiolorum* occurred over a range from 35° to 75°, with an optimum between 55° and 65°, the corresponding figures for *C. lunata* being 45° to 85° and 75° to 85°, respectively.

Botrytis elliptica [ibid., 30, p. 163] and *Colletotrichum lilii* [ibid., 27, p. 186] grew best at 65° to 75° and 75° to 85°, respectively. The former species infected Easter lily [*Lilium longiflorum* var. *eximium*] foliage between 35° and 75° but not at 85°. At the lower range there were numerous small lesions and the course of infection was slower than at 65°, at which temperature the disease was most severe.

The optimum temperature for the development of *Fusarium oxysporum* f. *narcissi* [*F. bulbigenum*: ibid., 29, p. 307; 30, p. 160] was 75°. King Alfred *Narcissus* bulbs inoculated and grown at soil temperatures ranging from 45° to 70° contracted infection most rapidly at 65° and 70°. Foliar symptoms were retarded by three weeks at a soil temperature of 55° as compared with 60°. Inoculated bulbs flowered normally at 55° before symptoms appeared on the leaves.

Bewley (W. F.) & Richards (A. A.). **Mosaic disease of the Chrysanthemum.**—*Gdnrs' Chron.*, Ser. 3, 129, 3341, p. 20, 2 figs., 1951.

There are indications that the incidence of chrysanthemum mosaic, caused by a strain of cucumber virus 1 [cucumber mosaic virus: *R.A.M.*, 19, p. 516; 29, p. 198], is increasing [in Great Britain] and may prove a menace to the cultivation of this plant if the disease is not eradicated. The disease cannot be diagnosed by eye inspection until the development of the first florets. The outer petals of an infected flower, particularly in the reflexed types, are very slender and tend to grow vertically upwards. When half-opened the buds resemble a round, sparsely bristled paint brush. Infected incurved and semi-incurved flowers are much smaller than healthy ones and the petals are twisted and bent. In some varieties, particularly Solomon, many of the outer petals grow downwards in a short, dense, twisted mass, completely covering the involucre and curling round the stalk. Infection has also been observed in Baldock's Crimson, Cheshunt White (Autocrat), Christmas Beauty, Favourite, Florina, Friendly Rival, Imperial Pink, Imperial Rose, Molly Nicholson, Monument, Santa Claus, and Rose Harrison. An important feature of the disease is the difference in the type of symptom from group to group, and also among varieties in the same group. Plants with mild symptoms should be destroyed as well as severely diseased ones. Cuttings should not be taken from infected plants; green fly and other sucking insects should be controlled and not allowed to breed.

Brierley (P.). **Some host plants of Chrysanthemum stunt virus.**—Abs. in *Phytopathology*, 40, 9, p. 869, 1950.

Practical control of chrysanthemum stunt virus [*R.A.M.*, 30, pp. 108, 162] and studies on other aspects of the disease have been hampered by the lack of a quick test for the presence of the virus. Selected varieties react after the lapse of two to three months. Manual inoculation of 30 Compositae, including eight species of *Chrysanthemum* and representatives of 21 other genera, resulted in the development of symptoms in three—*C. praealtum*, *C. coccineum* (marked and slight stunting, respectively), and cineraria. The last-named developed primary spots 20 to 30 days after inoculation, followed by erect growth with paler leaves and marginal ruffling, and may well prove useful as a test plant for the stunt virus. *C. carinatum*, *C. coronarium*, *Achillea ptarmica*, *Anthemis tinctoria*, *Centaurea cyanus*, *Dahlia variabilis*, *Echinacea purpurea*, *Emilia sagittata*, and *Liatris spiata* served as symptomless carriers, from which the virus was recovered in the Mary MacArthur variety.

Cornuet (P.), Martin (C.), & Limasset (P.). **Extraction du virus de la mosaïque du Dahlia (Marmor dahliae Holmes) à partir de Dahlias infectés et obtention de son antisérum.** [Extraction of the Dahlia mosaic virus (*Marmor dahliae* Holmes) from infected *Dahlia* plants and procurement of its anti-serum.]—*C. R. Acad. Sci., Paris*, 231, 18, pp. 913–914, 1950.

By a method which is fully described the authors isolated from infected dahlia plants a specific antigen probably representing the dahlia mosaic virus itself. Further studies are in progress to determine the fundamental properties of this virus, a limiting factor in the cultivation of the plant in France [*R.A.M.*, 25, p. 303].

Sharma (O. P.) & Mahmud (K. A.). **Damping-off of Antirrhinum majus L. caused by Rhizoctonia (Corticium) solani Kuhn.**—*Mag. agric. Coll. Nagpur*, 25, 1–2, pp. 47–48, 1950.

Corticium solani was isolated from the root systems of damped-off *Antirrhinum majus* seedlings [*R.A.M.*, 20, p. 580] at Nagpur in October, 1948, this being the

first record of its occurrence on this host in India. In inoculation experiments in autoclaved soils 79 per cent. of the seedlings died within a fortnight of germination, and the pathogen was reisolated from them.

BEAUMONT (A.). **Begonia diseases.**—*Gdnrs' Chron.*, Ser. 3, 129, 3343, p. 37, 1951.

The most serious disease of winter-flowering begonias in England is probably bacterial blight (*Xanthomonas begoniae*) [*R.A.M.*, 17, p. 748]. Mildew (*Oidium begoniae*) [cf. ibid., 18, p. 724; 27, p. 422] has become more severe. The only virus disease known to be affecting this host in England is tomato spotted wilt [ibid., 15, 444; and cf. ibid., 29, p. 414].

PATEL (M. K.). **Bacterial leaf spot of Desmodium diffusum DC.**—*Indian Phytopathology*, 2, 2, pp. 168–172, 1949. [Received October, 1950.]

This is a full account of the angular leaf spot of *Desmodium diffusum* caused by *Xanthomonas desmodii* [cf. *R.A.M.*, 28, p. 577]. The bacterium, rounded at both ends, measures 1·6 to 2·4 by 0·4 to 0·8 μ, and is pathogenic only to *D. diffusum*.

ALLISON (J. L.), WELLS (H. D.), & ANDES (J. O.). **Diseases reduce Vetch seed crop in Tennessee in 1950.**—*Plant Dis. Reptr*, 34, 10, p. 321, 1 fig., 1950. [Multilithed.]

The severe seed crop losses of hairy vetch (*Vicia villosa*) in 1950 in Tennessee were mainly due to anthracnose (*Colletotrichum villosum*) [*R.A.M.*, 28, p. 595] and blight (*Ascochyta pisi*) [ibid., 19, p. 224]. Both pathogens were universally present in the fields, and were readily isolated from all parts of the plants, including seeds. The epiphytotic was favoured by an unusually warm winter, during which the plants made rapid growth, followed by heavy rains in May and the first part of June. Severe lodging of the vetch and its companion wheat crop helped the development and spread of both diseases.

JOHANSEN (GUDRUN). **Stængelsvamp på Lucerne (Colletotrichum trifolii).** [Stem fungus on Lucerne (*Colletotrichum trifolii*).]—*Månedsovers. Plantesygd., 1950*, 314, pp. 105–106, 1 fig., 1950.

In September, 1949, *Colletotrichum trifolii* [*R.A.M.*, 28, p. 116] was observed on lucerne in various parts of Zealand and Lolland, Denmark, and in August and September, 1950, the fungus was widespread over the country, chiefly affecting the du Puits variety.

GRANITI (A.). **Su alcuni fungilli graminicoli dell' Africa orientale.** [Some graminicolous fungi of East Africa.]—*Nuovo G. bot. ital.*, N.S., 57, 1–2, pp. 247–256, 1 fig., 1950.

This annotated list of 24 graminicolous fungi collected in Eritrea and Abyssinia includes *Phyllachora tricholaenae* on leaves of *Rhynchelytrum repens*, a new record for this region, and *Uromyces eragrostidis* on the leaves of *Eragrostis* sp. [*R.A.M.*, 19, p. 84], as well as three new species.

SAFEEULLA (K. M.) & GOVINDU (H. C.). **Cintractia minor on three species of Cyperus in Mysore.**—*Curr. Sci.*, 19, 10, pp. 325–326, 1950.

Comparative studies on smut collections from *Cyperus rotundus*, *C. compressus*, and *C. pangorei* near Hebbal, Bangalore, indicated that a single species, *Cintractia minor*, was involved on all three hosts. A review of the literature revealed confusion between this species and *C. peribebuyensis* [*R.A.M.*, 28, p. 362], to which previous Indian material of the *Cyperus* smut has been incorrectly referred. Infection occurred both on the peduncles and within the ovary, in which the seed was replaced by an agglutinated, olive-black mass of subglobose to spherical, individually reddish-brown spores, 9 to 12·5 (mean 11) μ in diameter.

Dawson (J. E.), Musgrave (R. B.), & Danielson (R. E.). **Effect of fungicides on occurrence of losses due to mold respiration during curing and storage of hay.**—*Agron. J.*, 42, 11, pp. 534–536, 1950.

Three of the 31 fungicides tested at the New York (Cornell) Agricultural Experiment Station for the control of [unspecified] mould development in bloom-stage lucerne hay [*R.A.M.*, 30, p. 43] of 85 per cent. relative air humidity and 20±4 per cent. water on wet basis, namely, dowicide 2 (2, 4, 5-trichlorophenol), dowicide 28 (2, 4, 6-trichlorophenol), and mycotox No. 1 (2, 4, 5-trichlorophenyl acetate), proved completely effective at rates of 6 to 8 lb. per ton. Mycotox No. 12 (tetrachlorophenyl acetate) and No. 20 (tetrachlorophenyl propionate), and dowicide 1 (orthophenylphenol) merit further investigation. Several of the remaining 25 preparations delayed but did not prevent mould development during the four weeks covered by the experiment.

Bould (C.), Nicholas (D. J. D.), Potter (J. M. S.), Tolhurst (J. A. H.), & Wallace (T.). **Zinc and copper deficiency of fruit trees.**—*Rep. agric. hort. Res. Sta. Bristol, 1949*, pp. 45–49, 2 pl., [? 1950].

A brief account of the work described in this paper has already been noticed [cf. *R.A.M.*, 29, p. 31]. The symptoms of zinc deficiency in apple trees at Wisley, Surrey [ibid., 27, p. 424; 29, pp. 171, 569], are fully described. The leaves of zinc-deficient pear trees are small with a diffuse interveinal chlorosis and a tendency to curl upwards and form rosettes. Bark necrosis may be aggravated by copper deficiency.

The first symptoms of copper deficiency in apples [ibid., 28, p. 338; 30, p. 22] appear early in July on the terminal leaves of current-year shoots as large, irregular, necrotic areas, followed by upward curling and distortion. The lower leaves are usually pale green, sometimes with numerous small, irregular, necrotic spots. At the end of July defoliation starts from the shoot tip, which begins to wither in September. The bark of the trunk is usually very rough with large necrotic areas. Similar symptoms appear on pears [ibid., 29, p. 264]. Leaves from the middle region of terminal apple shoots with summer die-back due to copper deficiency contained under 5 μgm. of copper per gm. of dry matter.

Trunk or branch injection of solid zinc sulphate and dormant and foliage sprays of this material correct zinc deficiency if carried out at the proper time and in specified amounts and concentrations. When solid zinc sulphate or solid copper sulphate are injected in the dormant season, both at one-fifth or one-half the rate recommended by Bennett for iron sulphate [ibid., 10, p. 677; cf. 27, p. 74], zinc deficiency is corrected and some response is obtained in the case of copper deficiency. A dormant spray of 4 per cent. zinc sulphate in February or a single application of a dilute solution (0·1 to 0·2 per cent.) with a wetter at petal fall or shortly after corrects the symptoms during the current season. If the spray is applied from July onwards normal growth results in the following year. Foliage sprays at 0·2 per cent. in June may cause slight to moderate leaf damage in certain apple varieties and severe defoliation in certain pear varieties. Injections and dormant sprays are non-injurious. Copper deficiency responded to foliage sprays of 4:4:50 Bordeaux mixture; further work is in progress.

Marsh (R. W.). **Developments in agricultural fungicides.**—*Nature, Lond.*, 167, 4238, pp. 97–98, 1951.

In this review, based on recent literature, of the newer materials employed for the protection of crop plants, their toxicity, and new methods of application, it is reported that for the control of apple scab [*Venturia inaequalis*: cf. *R.A.M.*, 29, p. 31] in Britain a level of field control equal to that given by 1 per cent. lime

sulphur spray was obtained in an extensive range of trials by glyoxalidines at 0·3 per cent., napthoquinones at 0·09 per cent., and phenyl mercury chloride at 0·01 per cent.

RICHARDS (M. C.). **Some notes on Apple disease control in New Hampshire.**—*Plant Dis. Reptr*, 34, 10, p. 299, 1950. [Multilithed.]

Evidence obtained in 1949 and 1950 in New Hampshire on the control of apple scab (*Venturia inaequalis*) with sulphur-nugreen combinations [*R.A.M.*, 30, p. 168] showed that unless thorough coverage is given a more serious scab infection may develop than with sulphur alone. At Durham on test plots of the McIntosh variety in 1950 the early-bloom and calyx sprays were delayed to permit some infection. Foliage scab in July was as follows: 5–100 kolospray (sulphur), 8·3 per cent.; the same plus nugreen (5–100), 64; ½–100 phygon XL, 0·3; the same plus nugreen, 1; puratized agricultural spray (1 pt.–100), 0·3; the same plus nugreen, 0, unsprayed 88.

Growers are advised to use a better protectant than sulphur or a material with eradicant properties in combination with nugreen.

VAN STUIVENBERG (J. H. M.) & POUWER (A.). **Onderzoek over de bestrijding van 'stip' bij Notarisappels.** [An investigation on the control of 'bitter pit' in Notaris Apples.]—*Meded. Direct. Tuinb., Wageningen*, 13, 4, pp. 201–211, 1 fig., 1950. [English summary.]

This is a tabulated survey of experiments carried out in 1948–9 in Holland on the control of bitter pit in Notaris apples by spraying with borax (1 and 0·5 per cent.) [cf. *R.A.M.*, 29, p. 468] and β-indole-acetic acid (1, 2, and 3 gm. per 100 l.). The effect of the former treatment was found to depend largely on the time of application, the best results being obtained about mid-July. Presumably the critical date is connected with a specific physiological condition in the tree, possibly that in which the percentage of growth hormones in the pip is smallest. Spraying with β-indole-acetic acid in July also gave good results. A correlation between bitter pit and a disturbance of the phytohormone economy is regarded as probable.

DOMINIK (T.). **Badania mykotrofizmu dzikich Grusz na terenie Polski z uwzględnieniem warunków bioekologicznych.** [Studies on the mycorrhiza of wild Pear trees in their various biocenoses in Poland.]—*Acta Soc. Bot. Polon.*, 20, 1, pp. 255–303, 19 figs., 1 map, 1950. [French summary.]

Anatomical studies of the mycorrhiza of wild pear trees growing in different parts of Poland [*R.A.M.*, 29, p. 167] in relation to the ecological conditions of the soil and the plant associations showed that ectotrophic mycorrhiza were present in 19 per cent., and were consistently associated with woodland conditions or with soils that had been fallow for some time. Endotrophic mycorrhiza were found in 81 per cent., and on the basis of Burgeff's classification (*Naturwissenschaften*, 31, 1943), 83·9 per cent. of these were tolypophagous. The autotrophic as well as mycotrophic rootlets often developed atypical root hairs, a few μ long. Many times (mostly in soils having a pH of 4·5) deformed rootlets were found that were typically mycorrhizal but not mycotrophic. The oldest, largest, and most fruitful wild pear trees were found on the loess of south-eastern Poland and the sandy clay soils of the central districts. These trees were growing on cultivated land and had endotrophic tolypophagous mycorrhiza. Ectotrophic mycorrhiza were abundantly developed in soils having a pH of 7·5.

The following method is proposed for the propagation of biologic races of pear trees adapted to certain soil types. Seedlings from seed of the best wild specimens growing on the soil type in question, are established around the parent trees. Suit-

able ones are later transported together with a small amount of soil to places where plantations of wild pears are to be set up, such as in protective belts round cultivated land, individuals being planted in a fairly large area so that they in turn may eventually be surrounded by young seedlings which will thus encounter the appropriate symbiotic fungi [ibid., 18, p. 406].

VERONA (O.). **Prospetto sinottico delle principali malattie crittogamiche dell' Olivo.** [Synoptic survey of the principal fungal diseases of the Olive.]—*Boll. tec. Ist. Pat. veg. Pisa* 1, pp. 234–240, 2 pl. (1 col.), [? 1950].

To facilitate prompt recognition brief descriptions in the form of a diagnostic key are given of the external symptoms of the principal diseases of the olive, recommendations for control being indicated. Browning of the root tips (*Cryptoascus oligosporus*) causes death of the rootlets. The brown, bottle-shaped perithecia contain a few brown, ovoid, double-walled spores. Control consists in measures designed to increase tree vigour. Root rot (*Rosellinia necatrix*) [*R.A.M.*, 3, p. 348; 15, p. 774; 19, p. 582] and root and collar rot (*Armillaria mellea*) [ibid., 3, p. 348; cf. 29, p. 292] are controlled by improving soil aeration, removing infected trees or roots, and applying quicklime to the ground. Trunk rot or 'lupa' is due to *Fomes fulvus* var. *oleae* [ibid., 6, p. 395; 7, p. 12; 28, p. 650] and similar fungi; parts of the cortex of the main roots cease growth and become hollow; the tissues turn brown and the condition spreads to the heartwood, which becomes spongy; the main branches and trunk are also affected. Pruning wounds should be disinfected and tarred, diseased bark with the affected wood should be removed and the cavity disinfected and, if necessary, filled with cement. Knot (*Bacterium* [*Pseudomonas*] *savastanoi*) [ibid., 28, p. 467] may affect the roots, though the branches and trunk are mainly involved. A reddish-grey necrosis of the bark of the branches caused by *Calospora oleicola* (pycnidial state *Hendersonia oleae*) appears to be confined to Argentina. Branches may also bear brown pustules caused by *Cytospora oleina* [ibid., 16, p. 588], infection following frost injury. Leaves and fruits are attacked by knot disease, parasitic 'brusca' (*Stictis panizzei*) [ibid., 16, p. 456], against which no control measures are known, sooty moulds [ibid., 29, p. 572], for example *Capnodium elaeophilum* [ibid., 16, p. 546], and other fungi, including *Peyronellaea* [?*Phoma*] *fumaginoides* [ibid., 7, p. 187; 26, p. 356; 27, p. 339], and leaf spot (*Cycloconium oleaginum*) [ibid., 28, p. 467]. The fruits (only, as a rule) are attacked by *Cylindrosporium olivae* [ibid., 16, p. 546], *Gloeosporium olivarum* [ibid., 29, p. 572], *Phomopsis* [*Macrophoma*] *dalmatica* [ibid., 16, p. 546; 28, p. 467, *et passim*], *Septoria oleagina*, and a *Bacterium* sp. referred to as 'Petri's species'. *Cylindrosporium olivae* produces circular or elongated, wrinkled, violaceous, later reddish-yellow, depressed spots with a dark rim near the base of the fruits. Infection starts in October, becomes apparent in November, and causes premature fruit-drop or the content of the fruit is reduced by the lipolytic enzymes produced by the fungus. Attack is favoured by the presence of other parasites, host debility, a wet autumn, or early cold spells. The rustic varieties are less susceptible than others. Copper sprays applied at the beginning of autumn are useful. *S. oleagina* causes irregular, pale yellow, later ochraceous-brown spots bearing black dots on mature fruits only; it generally attacks trees already debilitated. Petri's bacterium causes irregular, brown or black, usually wrinkled spots to appear on the pericarp; the condition seems to occur following insect punctures and is not common.

KEARNS (H. G. H.) & MORGAN (N. G.). **The automatic spraying of top fruit with a spray 'mast'.**—*Rep. agric. hort. Res. Sta. Bristol, 1949*, pp. 104–110, 1 fig., [? 1950].

To obtain information on the relative efficiency of different sprayers tests were

carried out at Long Ashton, Bristol, for two seasons using a high-pressure spray machine with brooms (lances) and an automatic machine with a mast. The former with three operators delivered 18 gals. per minute through six ¾-in. B.S.P. nozzles (three on each broom), at an output per broom of 7 to 8 gals. per minute (325 lb. per sq. in.) through 60 ft. of ½-in. bore hose. The latter machine, with one operator, gave 35 gals. per minute through 16 B.S.P. nozzles (¾-in.) at an output per half mast (8 nozzles) of 17 gals. per minute (250 lb. per sq. in.). The mast consisted of two ¾-in. galvanized steel tubes arranged vertically at the rear, was adjustable for height, and could be placed flat on the tank when not in use. The height was arranged so that the top nozzle was 12 ft. from the ground. Each machine sprayed under similar conditions half an 8·6-acre orchard of 15-year-old bush apples planted 20 by 20 ft. and a 4-acre orchard of bush pears (20 by 15 ft. and 9 to 12 ft. high).

The results showed that about the same volume of wash was applied by the two methods. The automatic mast applied the fluid in half the time at one-fifth of the expenditure of labour and at half the cost of tractor fuel. There was no difference in control of apple scab [*Venturia inaequalis*]. The mast machine gave very high control of pear scab [*V. pirina*].

It is concluded that automatic spraying of top fruit by high hydraulic pressure is satisfactory provided the nozzle assembly, pump delivery, and tree 'make-up' are suitable. The mast must be as tall or nearly as tall as the trees. For application of spray material from one side only of the machine to bush trees of not more than about 15 ft. high, pump delivery must be at least 20 gals. per minute at a flow pressure of at least 250 lb. per sq. in.

KEARNS (H. G. H.) & MORGAN (N. G.). **A lightweight spray nozzle (¼" B.S.P.) for 'small' and 'large' volume spraying.**—*Rep. agric. hort. Res. Sta. Bristol, 1949*, pp. 111–114, 1 fig. [? 1950].

Details are given of a simple, lightweight, small-volume (8 fl. oz. per minute) nozzle for spraying purposes, designed to facilitate cheap manufacture and to ensure a uniform performance. It may be used for large-volume (35, 80, and 90 fl. oz. per minute) spraying by a simple interchange of cheaply made parts. It comprises a body, nozzle cap and gasket, filter, swirl chamber plate, and disk, and is screwed into a lance adapter tapped ¼-in. B.S.P. or into saddles tapped ¼ in. on spray booms and brooms. In both assemblies it operates at 40 to 75 lb. per sq. in. pressures. It may be used singly on a lance, in numbers on a straight boom, or in rings on machines using air flow. It may be made entirely of brass of a total weight of ¾ oz. approximately, but resistant steel or bronze is preferable.

Plant pests and diseases committee report on spray damage conference.—*Ann. appl. Biol.*, 37, 3, p. 556, 1950.

At a conference on spray damage held at Imperial College, London, in January, 1949, the various aspects of damage caused by sprays, the influences of methods of application, varieties, nutrition, and locality were outlined by H. MARTIN, M. H. MOORE, A. E. MUSKETT, and W. A. R. DILLON WESTON. Specific fundamental physiological problems for future research were discussed.

BALDWIN (M. M.). **Sulfur in fungicides.**—*Industr. Engng Chem.*, 42, 11, pp. 2227–2230, 1 diag., 1950.

This paper (included in a sulphur symposium) presents a summary, based on 32 contributions to the literature, of the position of sulphur and its compounds in the field of agricultural fungicides [*R.A.M.*, 30, p. 175]. The mechanism of the fungicidal action of sulphur is briefly discussed. Many of the developments referred to have been noticed from time to time in this *Review*.

Mallamaire (A.). **La défense des végétaux au Maroc français.** [Plant protection in French Morocco.]—*Agron. trop.*, 5, 11–12, pp. 636–645, 6 figs., 1950.

Following a recent inspection tour the author describes the organization and function of the Plant Protection Service in French Morocco, and outlines the quarantine measures in force to control the movement of plants to and from the area and within its boundaries [*R.A.M.*, 26, p. 80], and also the legislation governing the control of plant parasites and the use of certain toxic compounds.

Piemeisel (R. L.) & Carsner (E.). **Replacement control and biological control.**—*Science*, 113, 2923, pp. 14–15, 1951.

Replacement control is aimed at the elimination of a particular kind of plant species by means of the natural process involved in secondary plant successions and applies chiefly to uncultivated land and pasture. The elimination of certain weeds on cultivated land by competition involves only the current generation of plants. Replacement by secondary succession may require a few to several years. That this method of control may also aid in the control of plant diseases is illustrated by the following example. In semi-desert vegetation Russian thistle [*Salsola kali*: *R.A.M.*, 27, p. 345], a pest in wheat crops and a favourable summer host for the breeding of the leafhopper [*Eutettix tenellus*] vector of beet curly top virus [ibid., 26, p. 530], was replaced first by mustards which, however, are favourable winter and spring hosts of this insect. But these in turn were replaced by downy chess [*Bromus* sp.], which is not a host of the leafhopper, yields more forage, and affords better protection for the soil. The whole process was completed in five or six years, a period which compares favourably with the time required for control through the development of resistant varieties, and as a long-term solution is less costly than mechanical or chemical methods or burning. Under proper conditions the temporary cover of rapidly growing annuals would, in turn, be replaced by native perennials, yielding a more stable cover and more reliable forage, unfavourable for the multiplication of beet leafhoppers.

Duché (J.) & Neu (J.). **Culture des microorganismes en milieu continu.** [Culture of micro-organisms in a continuous medium.]—*C. R. Acad. Sci., Paris*, 231, 1, pp. 83–85, 1 fig., 1950.

The writers describe a special technique for the culture of micro-organisms involving the use of an open cylindrical culture vessel of Pyrex glass, the upper aperture receiving the medium from a bulb connected with it by tubing and the lower one discharging the metabolic products into an Erlenmeyer flask. After two months *Trichophyton gypseum asteroides* [*T. mentagrophytes*], which in ordinary culture undergoes pleomorphism in a period of three weeks, presented a normal aspect when subcultured from continuous culture on to the usual media. Similarly, a strain of *Penicillium lilacinum*, which had lost its violaceous pink tint, regained its normal colour in continuous culture.

Keil (J.). **Neue Bakterien mit vornehmlich fungostatischen Stoffwechselprodukten.** [New bacteria with predominantly fungistatic metabolic products.]—*Naturwissenschaften*, 37, 20, pp. 476–477, 1950.

Two new bacteria isolated from the air of the microbiological laboratory of the Botanical Institute of Mainz University proved to be highly antagonistic in molasses agar cultures to a number of fungi. One is designated *Sporobacterium fungostaticum* and the other *Bacillus antimycoides* on account of its strongly inhibitory effect on *B. mycoides*. *S. fungostaticum* largely suppressed the development of *Alternaria tenuis* M1003, *Fusarium nivale* [*Calonectria nivalis*] M56, and *Monilia cinerea* [*Sclerotinia laxa*], and was moderately active against *Penicillium notatum*, *P.*

chrysogenum, *Aspergillus niger*, *Sphaerotheca mors-uvae*, and *Oospora lactis*. *Sclerotinia laxa* also made little growth in the presence of *B. antimycoides*, but the action of the latter on the other fungi named was weaker than that of *Sporobacterium fungostaticum*.

The mildewing of wool : causes and prevention.—*Wool Sci. Rev.*, *1950*, 6, pp. 31–42, 8 figs., 1950.

Much useful information on the etiology and control of wool mildewing is here presented under the general headings of the production of mildew, the detection of mildew damage, occurrence of mildew during wool manufacture, mildew-proofing with antiseptics, and the rot-proofing of paper-makers' felts.

Sen Gupta (S. R.), Nigam (S. S.), & Tandan (R. N.). **A new wool-destroying fungus—Ctenomyces species.**—*Text. Res. J.*, 20, 10, pp. 671–675, 7 figs., 1 graph, 1950.

The authors describe a species of *Ctenomyces* isolated on Thornton's agar medium only from severely damaged wool at the Technical Development Establishment Laboratory (Stores), Kanpur, India. On various standard agar media the fungus formed dense, white, slightly raised, regular, roughly circular colonies, with a few faint concentric zones. The subaerial hyphae bear irregularly all over their surface numerous usually terminal or lateral, sometimes intercalary conidia, sessile or provided with a slender stalk. The terminal conidia are white, generally oval, 4·6 by 3·5 μ, with a comparatively thick wall, enclosing one to three globular, refractive bodies. The spherical lateral conidia average 3·5 μ in diameter. The hyaline, thick-walled, intercalary chlamydospores are spherical, oval, or semi-lunar, occurring in pairs or sometimes three or four in a chain, and measure 5 to 6 by 4 to 5·6 μ. Perithecia develop on wool after three to four months' incubation. The brownish-yellow, thick-walled asci are usually spherical or oval, 247 to 284 by 150 to 247 μ, and contain six to eight yellowish-brown, somewhat fusiform ascospores, average 5·2 by 3·5 μ.

In two trials (March and June, 1949), the percentage losses in breaking strength of woollen fabrics inoculated with the new *Ctenomyces* after 9, 11, and 14 days were estimated at (1) 80·5, 80, and 93, and (2) 80, 85, and 88, respectively. The capacity of the fungus for the deterioration of wool is thus of a very high order, exceeding (in the opinion of Dr. C. W. Emmons) that of *Microsporum gypseum* [*R.A.M.*, 29, p. 375], hitherto regarded as the most destructive of the wool-degrading species. The new pathogen is suitable, therefore, as a test organism.

Barghoorn (E. S.). **Histological study of the action of fungi on leather.**—*J. Amer. Leath. Chem. Ass.*, 45, 10, pp. 688–700, 18 figs., 1950.

The studies herein described were undertaken as part of the Leather Research Program, sponsored by the Research and Development Branch, Military Planning Division, of the Office of the Quartermaster General, United States Army. Leather samples specially prepared and representing three standard methods of tanning were inoculated with *Aspergillus niger* [*R.A.M.*, 28, p. 583] and placed in moist chambers at room temperature and saturated humidity. Histological examinations of selected specimens were made after two and six months. The vegetable-tanned samples were found to support a more vigorous mycelial growth than the chrome-tanned. In no case did *A. niger* remain as the dominant organism in the fungal flora on the inoculated strips. No deterioration of the leather substance by the moulds involved could be determined. Apparently the profuse development of mildew on fresh leather is at the expense of substances incorporated in it during tanning and subsequent treatment, and not at that of the collagen matrix of the hide.

Owen (W. L.) & Bienvenu (R. J.). **An improved substrate for enumeration of mold fungi in sugar.**—*Sugar*, 44, 5, pp. 30–32, 3 figs., 1949.

The writers report highly satisfactory results from the use of Littman's medium [*R.A.M.*, 27, p. 82] in place of Sabouraud's agar for counting moulds in raw and refined sugar. It restricts 'spreaders' in the mould colonies and eliminates bacteria and yeasts.

Yushok (W. D.) & Romanoff (A. L.). **Prevention of mold growth in intact eggs by treatment with a cationic detergent.**—*Food Res.*, 15, 1, pp. 1–7, 1950.

The results of studies at the New York (Cornell) Agricultural Experiment Station showed that eggs stored at relative humidities between 98 and 100 per cent. and at room temperature develop shell-adhered yolks and heavy external [unspecified] mould growth [*R.A.M.*, 20, p. 464; 29, p. 40] within a 20-day period. During further storage prolific fungal development occurs within the eggs. The rots were red, black, or of mixed colours. Absolute protection was conferred by immersion prior to storage in a 0·05 per cent. aqueous solution of cetyl pyridinium chloride [cf. ibid., 29, p. 323]. The most reliable procedure is to apply the mould-preventive, incorporated in one of the sealing agents, e.g., mineral oil, polystyrene chlorinated rubber, or polyvinyl acetate, as soon as possible after the eggs are laid.

Harley (J. L.) & McCready (C. C.). **The uptake of phosphate by excised mycorrhizal roots of the Beech.**—*New Phytol.*, 49, 3, pp. 388–397, 1 pl., 6 graphs, 1950.

In studies made during spring and autumn, 1949, in the Department of Botany, University of Oxford, the excised apices of beech roots were exposed to culture media containing phosphate as P^{32}. Uptakes of phosphate determined mainly by metabolic activity were found to occur, the rates in mycorrhizal roots [*R.A.M.*, 19, p. 231] exceeding those of non-mycorrhizal roots both on an area and on a fresh-weight basis.

Richards (Rebekah R.). **Responses of representative fungi to certain growth-regulating substances.**—*Bot. Gaz.*, 110, 4, pp. 523–550, 7 figs., 7 graphs, 1949.

At Chicago University the effects of indole-3-acetic acid (IAA), α-naphthaleneacetic acid (NAA), 2,4-dichlorophenoxyacetic acid (2,4-D), and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) on the growth of *Phycomyces blakesleeanus*, *Neurospora tetrasperma*, *Schizophyllum commune*, and *Aspergillus candidus* were not constant throughout the test period. All four substances inhibited the growth of the primary mycelium of *S. commune*, the degree of inhibition increasing in proportion to the concentrations. Stimulated responses occurred in the late phases of growth of *A. candidus* [*R.A.M.*, 29, p. 558] in the presence of 2,4-D, 2,4,5-T, and NAA, the last-named stimulating growth rates continuously from the beginning, the maximum stimulation (22 per cent.) being exerted in the late stages. The percentages of spores of *A. candidus* germinating in 24 hours were inversely related to the concentrations of IAA, 2,4-D, and 2,4,5-T and were always less than the controls. NAA increased germination between 0·001 and 0·00018 M. Treatments with NAA and IAA at concentrations which were completely inhibitory to vegetative growth caused decreases in the percentage germination of *A. candidus* conidiospores in proportion to the length of treatment and the concentration used. Similar treatments with completely inhibitory concentrations of 2,4-D and 2,4,5-T effected a 95 to 100 per cent. reduction in germination percentage of the spores within 24 hours after removal from the solutions.

Mitchell (J. E.) & Angel (C. R.). **Plant growth-regulating substances obtained from cultures of Fusarium moniliforme.**—Abs. in *Phytopathology*, 40, 9, pp. 872–873, 1950.

Fusarium moniliforme [*Gibberella fujikuroi*] in a cerelose-ammonium sulphate medium produces, when the carbohydrate is nearly exhausted, a substance imparting a marked stimulus to the elongation of bean [? *Phaseolus vulgaris*] plants, analogous to that associated with the 'bakanae' disease of rice in Japan caused by the same fungus [*R.A.M.*, 29, p. 475]. The rapid, diffuse growth of the pathogen is accompanied by an abrupt drop in the pH of the medium to about 2·5. The active component is weakly acidic and soluble in polar solvents and alkaline solutions. It is stable in acid solutions but inactivated at higher pH levels. Its activity differs from that of indoleacetic and 2,4-dichlorophenoxyacetic acids. Six days after immersion of the distal end of a primary leaf petiole in a vial containing the test solution, the bean plants measured 500 mm. from the axil of the primary leaf to the tip of the terminal inflorescence, as compared with 35 mm. for the controls. The flowers and pods on the treated plants were normal. A second type of activity was observed in certain preparations of the substance inducing pronounced torsion and later gall formation on the treated plants. The latter symptom commonly occurs at the terminal growing point, preventing further development. No fruits were produced by plants treated with the growth substance at the flowering stage.

Sempio (C.). **Metabolic resistance to plant diseases.**—*Phytopathology*, 40, 9, pp. 799–819, 2 figs., 2 graphs, 1950.

Some of the 28 contributions to the relevant literature forming the basis of the author's discussion on metabolic resistance to plant diseases have already been noticed in this *Review* [*R.A.M.*, 28, pp. 349 *et seq.*].

Ross (H.) & Baerecke (M[aria]-L[uise]). **III. Selection for resistance to mosaic virus (diseases) in wild species and in hybrids of wild species of Potatoes.**—*Amer. Potato J.*, 27, 8, pp. 275–284, 1950.

In 1947 and 1948 testing and selection for resistance to potato viruses X, B (strain of potato virus X), Y, and leaf roll in 14 *Solanum* species represented by 21 variants and 49 hybrids were carried out at the Max Planck Institute, Voldagsen, West Germany [see next abstract]. The seedlings were inoculated by sap inoculation, grafting, or by aphids, based on the methods of preliminary selection practised by Stelzner from 1939 to 1944, and tested back to tobacco, and other susceptible plants. Unlike cultivated varieties, wild species almost invariably exhibit symptoms when viruses X and Y are present. Immunity from virus X [*R.A.M.*, 29, p. 425] was found only in several plants of *S. acaule*, which appeared to be homozygous for this character. Immunity from virus Y [ibid., 21, p. 469] was found in *S. chacoense*, *S. cordobense*, *S. garciae*, *S. catarthrum*, *S. macolae*, *S. ajuscoense*, *S. antipoviczii*, and *S. polyadenium* and possibly in *S. demissum*, *S. chaucha*, *S. rybinii*, and *S. commersonii*. Immunity from virus A [ibid., 29, p. 378] appeared to be as general as for virus Y. Only *S. chacoense*, *S. catarthrum*, and *S. andigenum* gave any hope of immunity from leaf roll [ibid., 29, p. 47; 30, p. 64, 188]. *S. polyadenium* and its *S. tuberosum* hybrids were highly tolerant of this virus.

Rudorf (W.). **IV. Methods and results of breeding resistant strains of Potatoes.**—*Amer. Potato J.*, 27, 9, pp. 332–339, 1950.

Efforts are being made at the Max Planck Institute, Voldagsen, West Germany, to breed potato varieties combining resistance to *Phytophthora infestans* [*R.A.M.*, 29, p. 579; 30, p. 70], virus diseases [see preceding abstract], and Colorado beetle [*Leptinotarsa decemlineata*]. The work has been complicated by the fact that the

species of *Solanum* resistant to all eight races of *P. infestans* [loc. cit.], namely the *S. demissum* varieties El Desierto (resistant to viruses X and Y), *tlaxpehualcoense* [ibid., 20, p. 379], and Lindley 029, *S. ajuscoense* (resistant to virus Y), and *S. polyadenium* (resistant to virus Y) are difficult to hybridize with potato varieties. Nevertheless one triple hybrid (*S. demissum*×*S. ajuscoense*)×*S. tuberosum* has been obtained. Also when crossed with types not resistant to all eight races it is almost impossible to recover this character in the offspring, unless very large numbers of seedlings are tested. From 1940 to 1944 about 500,000 seedlings from planned crossings have been selected yearly and 25 per cent. proved to be completely resistant. Vigorous roguing for virus diseases (mainly leaf roll) in 1947 and 1948 left clones which exhibit a grade of resistance equivalent to that of Ackersegen, Aquila, and Bona. Only those resistant to wart [*Synchytrium endobioticum*] are retained. It appears, however, that a new physiologic race of *S. endobioticum* (Giesshuebel) has been recognized in Thuringia. Inbreeding has been initiated to obtain lines homozygous for blight resistance. For hybridization and backcrossing to include virus resistance *S. antipoviczii* and *S. chacoense* (both resistant to virus Y and tolerant of leaf roll), *S. verrucosum* (tolerant of leaf roll), *S. rybinii*, and *S. kesselbrennerii* (the two last resistant to virus diseases, especially Y), have been used with the above mentioned species or *S. tuberosum*. All are resistant to the Colorado beetle.

Heinze (K.). **Die Überwinterung der grünen Pfirsichblattlaus Myzodes persicae (Sulz.) und die Auswirkung der Überwinterungsquellen auf den Massenwechsel im Sommer.** [The overwintering of the green Peach aphid *Myzodes persicae* (Sulz.) and the effect of the overwintering sources on mass migration in the summer.] -*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 2, 7–8, pp. 105–112, 2 maps; 9, pp. 145–148, 2 graphs, 1948. [Received June, 1950.]

In Germany *Myzodes* [*Myzus*] *persicae* [*R.A.M.*, 29, pp. 379, 395, 636 and next abstract] can overwinter outdoors only in the egg stage on peach trees and peach hybrids and occasionally on apricot trees. The incidence of virus diseases of cultivated plants transmitted by this vector is therefore highest in districts with extensive peach plantings. The spread of aphids from glasshouses [loc. cit.] and potato cellars in seed potato districts is of little importance. *M. persicae* cannot overwinter if temperatures of —12° C. are maintained for some time, as is often the case in North Germany. In seed potato districts in which the summer forms cannot normally overwinter, an order prohibiting peach and apricot cultivation would appear appropriate [ibid., 29, p. 225].

Müller (F. P.). **Die Überwinterung der grünen Pfirsichblattlaus Myzodes persicae (Sulz.) als Virginogenia an Zier- und Gewächshauspflanzen.** [The overwintering of the green Peach aphid *Myzodes persicae* (Sulz.) as agamic females on ornamental and glasshouse plants.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 3, 3–4, pp. 41–44; 5–6, pp. 100–104, 1 fig., 1949. [Received June, 1950.]

Surveys of 62 glasshouses in the Saale-Elster area, Germany, between the middle of January and the end of March, 1949, demonstrated that *Myzus persicae* [see preceding abstract], the most dangerous vector of potato virus diseases, was absent in only five cases (8 per cent.). Of 74 ornamentals examined in a greenhouse at the Naumburg branch of the Central Biological Institute at ten-day intervals from 10th November, 1948, to 31st March, 1949, at least 45 harboured the aphids. The following had the largest populations: *Asparagus sprengeri*, *Solanum capsicastrum*, cineraria, *Calceolaria*, *Kalanchoë*, *Chlorophytum comosum*, *Chrysanthemum indicum*, *Dianthus*, tulip, lily of the valley, and *Euonymus japonica*. In the spring the winged forms leave the glasshouses and also great numbers of the insects in all stages are

set free by the removal of their host plants. The agamic females may produce two generations in the open before migration from peach trees takes place.

It is concluded that in the densely populated areas of central Germany overwintering of *M. persicae* in glasshouses is of great importance, and that the destruction of winter eggs and their hosts [ibid., 30, p. 118] is not always a sufficient control measure.

LUNDEN (A. P.). **Undersøkelser over reaksjon mot kreft (Synchytrium endobioticum) hos Potet.** [Investigations on the reaction of Potato to wart disease (*Synchytrium endobioticum*).]—*Meld. Norg. LandbrHøgsk.*, 30, 1, pp. 1–48, 1950. [English summary.]

These investigations, conducted in co-operation with Dr. I. Jørstad as a joint undertaking of the Farm Crop Institute, College of Agriculture of Norway, and the State Plant Protection Institute, Botanical Museum, Oslo, comprise the testing of potato varieties against wart disease (*Synchytrium endobioticum*) from 1939 to 1946 [*R.A.M.*, 25, p. 575; 30, p. 70] (including an abridged list of all those tested between 1919 and 1946) and the results of studies on the inheritance of reaction to the pathogen. Immune varieties in the 1939 to 1946 tests were The Alness, Altgold, Anseth, Arminius, Arran Cairn, Arran Peak, Arran Scout, Ballydoon, Bardengold, Blauschalige, Brennragis, Burbank, Carnea, Commander, Craigs Defiance, Daber, Daler, Danskar, Doon Early, Doon Pearl, Duke of Kent, Dunbar Archer, Dunbar Rover, Dunbar Standard, Eclipse, Edelgard, Erfurter Perle, Fanapotet, Feldglück, Fram, Früheste Delicatess, Frühgold, Fältmarskalk French, Gammal svensk Rød, Glen Clova, Goldadler, Goldfink, Goldgelbe, Goldwährung, Golfragis, Hedemarkspotet, Hellrote, Herulia, Houma, Isolde, International Kidney, Jørstadpotet, Jøssing, Konsuragis, Lichtblick, Mossros, Mr. Bresee, Møwe, Per Jan (= Irish Cobbler), Pink Fir Apple, Poloragis, Prestkvern, Prisca, Professor Maercker, Ranfurley Red, Redskin, Regina, Rislepotet, Robinia, Rosarie, Rote Mause (= Tannenzapfen), Rotweissragis, Rubingold, Rødbrokig från Dagløsen, Rødbrokig Svensk, Sallad Horn (= Frühe Hörnchen), Sandnudel, Schlesien, Schneeragis, Sefton Wonder, Sieglinde, Sigtuna III, Snølockor, Sockerpotatis I, Sockerpotatis II (= Arran Banner), Spanjorer, Spätrot, Stärkeragis, Topas, Treff As, Triumph, Tysk blåpotatis, Ulster Monarch, Unbyn, Weisses Rössl, and Adalens nyhet 28.

Breeding ratios showed that immunity from wart disease must be regarded as a dominant character, depending in most cases on a single dominant factor. Sometimes, however, the ratios are very complex and explicable only on a basis of several immunity factors. From this work, especially from the results of crosses between the immune Jubel and the susceptible Centifolia, the following are presumed to be concerned. X, a factor for immunity, is dominant also in the heterozygous simplex (X x3) condition and induces immunity independent of any other factor. When present in the simplex condition it acts as a simple dominant. Plants of the genotype X2 x2 (duplex) segregate when selfed in an approximate 35 immune: 1 non-immune ratio, and when crossed with a fully recessive the ratio is 5 : 1. To this type undoubtedly belong Kerr's Pink and Doon Star. Crosses of the genotypes X2 x2 and X x3 (or reciprocal) will give 11 : 1 ratios. Y and Z are two complementary factors which together confer immunity, but are independent of X. The presence in one variety or hybrid of all these factors will result in a very complicated segregation for immunity.

The most important conclusion from these data is that immunity from wart disease is not present in a homozygous state in any of the immune varieties tested. These do, however, vary greatly in their value as breeding material; some, like Kerr's Pink and Doon Star, produce a high proportion of immunes, so that fewer plants have to be discarded. In connexion with the existence of biologic specializa-

tion within *S. endobioticum* [ibid., 29, p. 529 and above, pp. 189, 241], these differences in genetic composition might assume significance.

Callbeck (L. C.). **Further studies on copper sulphate-lime ratios in Bordeaux mixture.**—*Amer. Potato J.*, 27, 9, pp. 327–331, 1950.

Further experiments were carried out in 1947 and 1948 at the Dominion Laboratory of Plant Pathology, Charlottetown, Prince Edward Island, on the control of potato blight (*Phytophthora infestans*) with Bordeaux mixture containing different lime ratios [cf. *R.A.M.*, 27, p. 194]. In 1947 Green Mountain potato plants sprayed with spore suspensions during August and September developed practically no infection until the end of September. There was little difference between the yields of the treated (seven applications between 14th July and 16th September) and untreated plots, both harvested on 6th October, the highest being from plots given the 4–2–40 concentration (340·2 bush. per acre; untreated 322·5). After four weeks in storage the tubers from treated plants had less than 1 per cent. rot due to blight, whereas non-treated ones suffered 8 per cent. loss.

In 1948 ideal conditions prevailed throughout the season for blight development, which was aided by artificial inoculation, and the untreated plots became heavily infected. Seven treatments were given between 19th July and 15th September and the tops killed with sodium arsenate on 28th September. The yields from all treatments were significantly higher than the controls, the figures for the 4–1–40, 4–2–40, 4–3–40, 4–4–40 concentrations being 300·5, 310·9, 299·5, and 301·2 bush. per acre and 0·9, 2·3, 0·9, and 3·9 per cent. tuber rot, respectively, compared with 205·9 and 7·5 for the untreated.

Data from 1943 to 1948, inclusive, indicate that a low-lime Bordeaux mixture is more effective than a high-lime one in controlling tuber rot due to blight, the ratio of mean losses for the six years for the 4–1–40, 4–2–40, 4–3–40, and 4–4–40 treatments and the untreated being 1:3:4:6:21.

Van Hoof (H. A.). **Enkele gegevens omtrent productie en gevoeligheid voor Phytophthora infestans de Bary in Indonesië van een 26-tal Aardappelvarietëiten.** [Some data relative to production and susceptibility to *Phytophthora infestans* de Bary in Indonesia of some 26 Potato varieties.]—*Landbouw*, 22, 7–9, pp. 408–410, 1950.

The results of preliminary experiments in Java in 1948 and 1949 on small consignments of some 26 potato varieties imported from Holland indicate that Profijt and Gloria, whether sprayed with Bordeaux mixture or left untreated, are much more resistant to *Phytophthora infestans* [*R.A.M.*, 30, p. 188] than Eigenheimer, used as a standard for comparison; Profijt, moreover, was definitely more productive. Spraying enhanced the resistance of Alpha, Wilpo, and Voran. The varietal responses to *P. infestans* observed in these trials do not correspond to those reported from Holland (24th Descriptive List of Varieties of Field Crops, 1949).

Spraing occurs locally in Indonesia, e.g., in parts of Java and on the east coast of Sumatra, and experiments are advisable to determine whether the resistance of Gloria and Profijt to this disease noted in Holland [loc. cit. and cf. ibid., 27, p. 235] is maintained in Indonesia.

Hollis (J. P.) & Goss (R. W.). **Factors influencing invasion of Potato by Erwinia carotovora.**—*Phytopathology*, 40, 9, pp. 860–868, 1950.

Studies were carried out at the Nebraska and Connecticut Agricultural Experiment Stations to determine the effects of heat, water, and time of holding on the reaction of freshly harvested potato tubers of 10 varieties to a single isolate of *Erwinia carotovora* [*R.A.M.*, 24, p. 115].

Heating the tubers under infra-red lamps until the tissue reached a temperature of 42° C. at a depth of 10 mm. did not predispose them to invasion by the pathogen. Moreover, when the heated tubers were cooled in air to room temperature before inoculation, they developed less soft rot than the unheated controls. Tubers heated in water to 42° contracted more rot than the unheated [cf. ibid., 28, p. 417], and when the heated tubers were cooled in air the incidence of decay was lower than with cooling in water. Inoculations made at a depth of 4·5 mm. resulted in more rot than at 2 mm., but the relative effect of cooling in air after heating was similar at both depths. The results of these experiments afford an explanation of the control of soft rot by drying washed potatoes in hot air [ibid., 20, p. 489].

There were highly significant differences in varietal reaction to *E. carotovora*, the experimental results indicating that Katahdin is the most and Cayuga the least resistant. Fair resistance was also shown by Nebr. No. 2 and Bliss Triumph.

Rankin (H. W.). **Studies of internal cork of Sweet Potatoes.**—Abs. in *Phytopathology*, 40, 8, pp. 790–791, 1950.

The results of insect transmission experiments with the internal cork virus of sweet potatoes at Tifton, Georgia [*R.A.M.*, 28, p. 408], indicated that *Myzus persicae* is implicated, but not leafhoppers or soil-inhabiting insects. Plants grown from affected sweet potatoes produced varying amounts of corky roots in field tests. In none of the plants was every root corky, and in 16 per cent. all were free from the defect, the expression of which appears to be influenced by environment. The Puerto Rico variety is highly susceptible to internal cork, 40 per cent. of the plants showing symptoms in 1949. Of 72 other varieties, selections, and seedlings grown in the field for periods of one to eight years and fully exposed to natural transmission, 75 per cent. developed no symptoms of infection.

Nugent (T. J.). **The relative importance of the various control measures for Sweet Potato scurf.**—Abs. in *Phytopathology*, 40, 9, p. 873, 1950.

In comparative experiments [? in Virginia] to determine the relative efficiency of various methods of combating sweet potato scurf [*Monilochaetes infuscans*: *R.A.M.*, 28, p. 111], an index was used ranging from 0 for no infection to 100 for severe scurf on all the roots. For potatoes harvested from apparently clean 'seed' the six-year average scurf index was 12·2 as against 42·1 for those from diseased 'seed'. Clean 'seed' in sand and soil bedding media gave average scurf indexes (in four tests) of 22 and 31·5, respectively, the corresponding figures in six tests on scurfed 'seed' being 45·1 and 45·2, respectively. In treatment trials (average of eight for both clean and scurfed) the indexes were 18·8 for mercuric chloride plus sulphur, 29·8 for mercuric chloride, and 34·8 for the untreated. In a similar test borax plus sulphur gave a scurf index of 23·4, borax 24·2, semesan bel 34·2, and no treatment 29·8. In two sprout treatment tests the scurf indexes for sulphur dust, semesan bel dip, and controls were 14, 13·9, and 27·4, respectively. Over a three-year period early plantings averaged 25·9 and late 23·2. In three tests with scurfed 'seed', the average indexes for sprout cuttings and pulled sprouts were 5 and 49·1, respectively.

Feazell (G. D.) & Martin (W. J.). **Studies on Ceratostomella fimbriata from Sweet Potato and Sycamore.**—Abs. in *Phytopathology*, 40, 8, p. 787, 1950.

A self-sterile strain of the canker stain fungus (*Ceratostomella* (?) *fimbriata*) from sycamore [*Platanus occidentalis*: *R.A.M.*, 27, p. 341], non-pathogenic to sweet potato, produced perithecia with a self-sterile isolate of *C. fimbriata* from the latter host [ibid, 29, p. 53]. The only three monoascospore cultures which developed from 255 isolated were self-sterile. One was only slightly pathogenic to sweet potato, and two, though definitely less injurious than the parent culture

from the same host, induced typical black rot symptoms. On potato dextrose agar these three single-ascospore cultures gave rise to numerous sector and patch mutants. The former varied in pathogenicity to sweet potato, while certain of the patch mutants were innocuous. From one of the self-fertile cultures 203 single-ascospore isolations produced only 13 cultures, all of which were self-fertile and of varying pathogenicity to sweet potato. Hybridization was thus apparently effected between these two morphologically similar, but genetically distinct, fungi from sweet potato and *P. occidentalis*.

Bottini (E.). **I microelementi nutritivi del terreno agrario. Nota III. Prove di vegetazione in vasi Mitscherlich con boro, rame e cobalto.** [The nutrient micro-elements of agricultural soils. Note III. Growth tests in Mitscherlich's pots with boron, copper, and cobalt.]—*Ann. Sper.agr.*, N.S., 4, 6, pp. 895–917, 1950. [English summary.]

In further studies on micro-elements in agricultural soils [cf. *R.A.M.*, 29, p. 330] with maize and flax, the former receiving the minimum rate of a general fertilizer and the latter the maximum the author obtained a general increase in dry weight following the addition to the soil of 0·1 to 1 mg. boron, 0·05 to 0·5 gm. copper, and 0·01 to 0·1 mg. cobalt. Increased leaf development occurred in oats receiving boron, copper (associated with the minimum level of fertilizer), and 0·01 mg. cobalt plus the minimum rate of fertilizer, while copper increased fruit production in dwarf peas and fibre production in flax. Copper at all concentrations tended to reduce the degree of absorption of mineral substances from the soil and boron sometimes to increase it.

Newhall (A. G.). **Flash flame soil pasteurizer.**—*Bull. N.Y. St. Flower Grs* 63, p. 2, 1 fig., 1950. [Mimeoprinted.]

An oil-burning, flash type soil pasteurizer made by the Tarrant Manufacturing Company, Saratoga Springs, New York, consists of a revolving cylinder 8 ft. long by 20 in. in diameter, which is kept in a slightly sloping position. The soil is shovelled into one end and trickles out of the other (heated to the desired temperature) about 10 seconds later. Heat is supplied by one or two blow torches mounted so that the flame is directed up inside the lower end of the cylinder and can be controlled to suit nearly all conditions. The final soil temperature is controlled by soil moisture, slope of cylinder, speed of shovelling, and size of flame, 180° F. being the preferred temperature. With a burner using 4 to 5 gals. of oil an hour the apparatus will treat nearly two bush. of soil per minute, at a cost for fuel of about one cent per bush.

Erwin (D. C.). **Phytophthora root rot of Safflower in Nebraska caused by Phytophthora drechsleri.**—*Plant Dis. Reptr*, 34, 10, p. 306, 1950. [Multilithed.]

The causal organism of root rot of safflower in Nebraska [*R.A.M.*, 28, p. 309] was recently identified as *Phytophthora drechsleri* [ibid., 26, p. 169]. In greenhouse pathogenicity tests at the Nebraska Agricultural Experiment Station, Lincoln, a high percentage of infection was readily obtained. Young, succulent plants develop necrotic lesions on the roots, followed by water-soaking and collapse of the cortical tissue of the lower stem. The plants fall over and wilt. The roots of older plants are covered with black, necrotic lesions, which extend 1 to 2 in. up the lower stem. Subsequently the leaves often turn yellow, the whole plant wilts and dies five to ten days later.

In experiments in which soil temperature tanks were used, the highest percentage of plants killed by the pathogen occurred at 25° and 30° C., a small percentage at 20°, and none at 17°. The optimum temperature for growth in culture was 30°.

Early planting and the limitation of irrigation to periods when the soil temperature is low are suggested control measures.

Lakshmikanta (S. R.) & Govindarajan (S. V.). **Sensitivity of Patchouli to manganese deficiency in soils.**—*Curr. Sci.*, 19, 9, pp. 280–281, 1950.

In the course of a study at the Agricultural Research Institute, Bangalore, Madras, on the influence of minor elements on crop growth, *Pogostemon patchouli* [*P. heyneanus*] was observed to show the characteristic symptoms of manganese deficiency in a soil containing only 60 p.p.m. of available manganese as compared with 122 in a normal area. The yellow spots between the veins and near the tips of the leaves of young plants gradually expanded until at maturity only the midrib and veins remained green. Spinach growing in the same soil was similarly affected [*R.A.M.*, 20, p. 438]. In both crops the leaves become abnormally thin, small, and sparse. The manganese contents of chlorotic patchouli and spinach foliage were 4 and 7·5 p.p.m., respectively, as against 12·5 and 10 for normal plants. The iron contents of the leaves were also abnormally low, 28·5 and 24·2 p.p.m. in patchouli and spinach, respectively, compared with 42·5 and 46·6 in healthy plants. The deficiency is controllable in young leaves by the application of manganese sulphate solution at 5 to 10 lb. per acre.

Buzacott (J. H.). **Recent trends in the production of Cane seedlings in Queensland by the Bureau of Sugar Experiment Stations.**—*S. Afr. Sug. J.*, 34, 11, pp. 721, 723, 725, 727, 1950.

The following references to phytopathological matters occur in this outline of the methods practised in Queensland for the testing of parent lines of sugar-cane [*R.A.M.*, 29, p. 478] since the reorganization of breeding work at Meringa in 1937. Owing to an outbreak of ratoon-stunting disease [ibid., 29, p. 202], the popularity of Q. 28 (Co. 290 × Q. 1098), which reached its peak of production in 1948, when about 1,000,000 tons were crushed, is waning to some extent and it is being superseded by Q. 50 (P.O.J. 2725 × Co. 290), of which even higher tonnages are expected.

Stevenson (G. C.). **Report on the Sugar Cane variety situation in Jamaica, April, 1950.**—*Bull. Brit. W. Ind. centr. Sug. Cane Breed. Sta. 32*, 8 pp., 1950.

In Jamaica the most widely cultivated sugar-cane variety, B. 34104 [*R.A.M.*, 30, p. 123], develops 100 per cent. infection with mosaic virus throughout the island, and it is hoped that it will be soon replaced by resistant varieties of equal commercial merits. B. 3439 [ibid., 29, p. 122] although somewhat susceptible, has a high degree of resistance to secondary infections and can be kept clean by regular roguing; it is also resistant to leaf spot (*Helminthosporium sacchari*) [ibid., 25, p. 542]. The resistant B. 37172 [loc. cit.] is fairly susceptible to leaf spot, but is grown extensively in wet areas. The mosaic-resistant seedling B. 3172 is fairly popular but has undesirable commercial features.

Of the new varieties bred at Barbados which have received some preliminary testing, the following show promise: B. 41227 [ibid., 29, p. 383] resistant to mosaic; B. 4362 (B. 37161 × P.O.J. 2878) combines exceptional commercial qualities with apparent immunity from mosaic; B. 4226, B. 42231, B. 43214, B. 44254, and B. 44341 [loc. cit.] are all mosaic-resistant seedlings which should be tested further.

As the new resistant varieties bred in Barbados often show susceptibility in Jamaica, where apparently different strains of the mosaic virus are present, a wider range of seedlings was sent to Jamaica for testing in 1949, together with parent material. Within three months 22 per cent. of the seedlings developed symptoms. A scheme is under consideration to raise seedlings in Jamaica from fuzz specially bred in Barbados and to select for further trial only those which prove resistant under conditions of severe mosaic infection.

It is recommended that all estates should increase their plantings of the mosaic-resistant new varieties to about 20 acres, even before the results of statistical trials are available.

CAIN (R. F.). **Studies of coprophilous Ascomycetes. I. Gelasinospora.**—*Canad. J. Res.*, Sect. C, 28, 5, pp. 566–575, 4 pl., 24 figs., 1950.

A description is given of the genus *Gelasinospora* Dowd. (1933) and its four species (to which a key is given), namely, *G. tetrasperma* isolated from beet seeds and *Festuca rubra* from Quebec, *G. cerealis* from the crown of wheat and oat plants in Manitoba, *G. adjuncta* n.sp., and *G. retispora* n.sp. found on chard seeds from Holland and on apple twigs in Quebec. The perithecia of the last-named are 700 to 1,000 by 400 to 600 μ, sometimes reaching 1,200 μ due to a more elongated neck. The neck is conical, black, and bare, 200 to 300 μ long, and lined with slender periphyses. The cylindrical, eight-spored asci measure 250 to 300 by 20 to 24 μ, are truncate at the apex with a large distinct perforation surrounded by a thickened ring, and have a tapering stipe 60 to 100 μ long; the asci are surrounded by hyaline filaments, tubular in the upper part and swollen to 15 μ to 30 μ in diameter in the lower. The obliquely uniseriate, ellipsoid ascospores measure 28 to 33 by 14 to 17 μ, turn olivaceous-brown and later olivaceous-black and opaque. The spore wall has low ridges 1 to 2 μ wide, which form a reticulate pattern surrounding angular pores 2 to 5 μ in diameter.

DAS (M. C.). **Morphology and cytology of Entyloma microsporum (Unger) Schroet. and Urocystis anemones (Pers.) Wint. on Ranunculus repens L.**—*Indian Phytopathology*, 2, 2, pp. 108–127, 39 figs., 1949. [Received October, 1950.]

Studies were carried out in the Department of Mycology, University of Edinburgh, on the cytology of the germinating chlamydospores of *Entyloma microsporum* [*R.A.M.*, 16, p. 62] and the life history and cytology of *Urocystis anemones* [ibid., 9, p. 737] both parasitizing *Ranunculus repens* near Edinburgh. The hyaline, yellowish-white spores of *E. microsporum* measure 12 to 16 by 14 to 18 μ; those of *U. anemones* measure 9 to 14 by 12 to 18 μ, the sterile accessory cells being 6 to 10 by 8 to 13 μ. Fresh mature spores of both species germinate within 48 hours in water, on plain agar, or on 2 per cent. malt agar. In *E. microsporum* the primary binucleate sporidia give rise to secondary binucleate sporidia or dikaryophytic hyphae. In *U. anemones*, however, only dikaryotic hyphae are produced. The diploid number of chromosomes is four in both species.

LING (L.). **Studies in the genus Cintractia. II. C. axicola and related species.**—*Mycologia*, 42, 5, pp. 646–653, 1 fig., 1950.

Descriptions and synonymy of five species of *Cintractia* [see above, p. 232] are presented. The spores of *C. axicola* [*R.A.M.*, 28, p. 362], the type species infecting *Fimbristylis* spp., may be smooth or faintly ornamented with pits or striae. *C. limitata*, on *Cyperus* spp., includes *C. minor* [ibid., 6, p. 144], sori occurring both at the base of the rays and on the spikelets in both species. Previously the position of the sori has been considered a distinguishing feature.

AINSWORTH (G. C.) & SAMPSON (KATHLEEN). **The British smut fungi (Ustilaginales).** —137 pp., 2 pl., 21 figs., The Commonwealth Mycological Institute, 1950. £1 or $3.

This useful monograph meets the real need for a new systematic treatment of the British smut fungi (Ustilaginales) and provides a good general and up-to-date account of the order [*R.A.M.*, 20, p. 179]. In the first half of the book an introductory discussion of the economic importance of the smuts and the smut diseases occurring in Britain is followed by chapters on their general biology, cytology, and

genetics; the techniques for collecting, examining, and storing material, and for germinating chlamydospores, preparing monosporidial cultures, and testing for the compatibility of monosporidial lines, the infection of the host, and fixing and staining are dealt with and there is a section on control.

The second half deals with descriptions of the 74 British species, with notes on spore germination, infection of the host, and racial specialization. There are keys to the families and genera. The bibliography refers to more than 600 papers. The authors' attitude to taxonomy is conservative. They are in agreement with other authors that as *Ustilago tritici* and *U. nuda* differ only in pathogenicity [ibid., 23, p. 170] they should be united in one species (*U. nuda*). For similar reasons *U. kolleri* is regarded as a synonym of *U. hordei*, and *U. perennans* as a synonym of *U. avenae*. *Entyloma calendulae* f. *dahliae* (Sydow) Viégas (*Bragantia*, 4, p. 748, 1944) is accepted for dahlia smut (*Entyloma dahliae*) and *E. calendulae* f. *bellidis* (Kreiger) n.comb. is proposed for *E. bellidis*, thus uniting all forms attacking Compositae into one species. Other new combinations are *Urocystis eranthidis* for the smut on *Eranthis hyemalis* and *Urocystis hepaticae-trilobae* for that on *Hepatica* spp.

Thirumalachar (M. J.) & Mundkur (B. B.). **Genera of rusts II.**—*Indian Phytopathology*, 2, 2, pp. 193–244, 82 figs., 1949. [Received October, 1950.]

The second paper in this series [cf. *R.A.M.*, 29, p. 537] contains an annotated alphabetical list of 50 genera of the Uredinales, each with a diagnosis, type species, distribution, taxonomic notes, and bibliography.

Patel (M. K.), Kamat (M. N.), & Bhide (V. P.). **Fungi of Bombay, supplement I.**—*Indian Phytopathology*, 2, 2, pp. 142–155, 1949. [Received October, 1950.]

This systematic list of 164 fungus records new to the State of Bombay, affecting 200 host plants, has been obtained since the publication of the fungi of Bombay in *Bull. Dep. Agric. Bombay* 176, 1936, and includes 11 bacterial diseases on 36 hosts. Among the new records are *Ustilago kolleri* on oats, *Colletotrichum lindemuthianum* on *Dolichos*, *Physoderma maydis* on maize [C.M.I. map No. 106], and *Pythium myriotylum* [*R.A.M.*, 29, p. 532] on ginger.

Payak (M. M.). **Some parasitic fungi collected in the vicinity of Banaras.**—*Indian Phytopathology*, 2, 2, pp. 190–192, 1949. [Received October, 1950.]

This is a systematic list of 64 fungi, including one new species, collected from 1947 to 1949 in the vicinity of Banaras, in the middle of the Gangetic plain. *Cercospora barlericola* is described as a new species on the ornamental shrub *Barleria cristata*.

Venkatarayan (S. V.). **The validity of the name Pellicularia koleroga Cooke.**—*Indian Phytopathology*, 2, 2, pp. 186–189, 1949. [Received October, 1950.]

The author gives reasons for rejecting Rogers's revival of the name *Pellicularia koleroga* [*R.A.M.*, 22, p. 372] for *Corticium koleroga*. He suggests that the valid name should be *Botryobasidium koleroga* (Cooke) n.comb. Alternatively, action should be taken to conserve *P. koleroga* Cooke emend. Rogers.

Marcelli (E.). **Ulteriori osservazioni sulla specializzazione dell' 'Oidio' del Tabacco.** [Further observations on specialization in the Tobacco *Oidium*.]—*Tabacco*, 54, 615, pp. 330–332, 1950.

The author considers that the tobacco powdery mildew fungus (*Erysiphe cichoraceaarum*) [*R.A.M.*, 29, p. 386] is not closely related to *E. polyphaga* [ibid., 25, p. 237], which differs in the morphological characters of the perithecia, while the former shows a certain tendency towards specialization on tobacco. Under conditions of natural and artificial infection in the greenhouse at a temperature of 25° to 28° C. and 60 to 75 per cent. relative humidity, the fungus soon developed

on tobacco, which became heavily infected, numerous perithecia being present 30 to 50 days after the formation of the mycelium. A slight mycelium with conidia also developed on squash (*Cucurbita maxima*) and other Curcubitaceae (except *C. anguria* [quoted as susceptible in error in ibid., 29, p. 386]). No infection developed on plants of numerous genera of 11 families known to be hosts of *E. cichoracearum*. It is concluded that the author's tobacco fungus, by reason of the morphology of its ascigerous state, belongs to *E. cichoracearum*, and that it shows a sufficient degree of specialization to justify Jaczewski's name *E. c.* f. *nicotianae* [ibid., 7, p. 346 (pp. 226–227 of this work)].

Marcelli (E.). **Carattere endemico dei 'tumori radicali' presumibilmente da Bact. tumefaciens, in campo di Tabacco (Nota preliminare).** [Endemic character of 'root tumours' presumably due to *Bact. tumefaciens* in a Tobacco field (Preliminary note).]—*Tabacco*, 54, 611, pp. 199–201, 2 figs., 1950.

This work has already been noticed from another source [*R.A.M.*, 29, p. 482].

Gigante (R.). **Le principali batteriosi del Tabacco.** [The principal bacterioses of Tobacco.]—*Tabacco*, 54, 609–610, pp. 109–127; 611, pp. 179–198; 612, pp. 213–228, 39 figs., 1950.

In the introduction to these papers it is stated that bacterial diseases of tobacco are becoming more prevalent in Italy, where they have hitherto received inadequate attention. An account, based largely on the literature, is given of the geographical distribution, losses caused by, symptoms, causal organism, and control of wildfire (*Pseudomonas tabacum*) [*R.A.M.*, 29, p. 482], Wisconsin leaf spot (*P. mellea*) [ibid., 3, p. 68; 10, p. 77; 14, p. 659; 23, p. 3], angular leaf spot (*P. angulata*) [ibid., 28, pp. 25, 312, 424], Philippine leaf spot (*P. polycolor*) [ibid., 10, p. 133; 22, p. 377], bacterial white spot (*P. maculicola*) [ibid., 4, p. 446; 6, p. 395], bacterial black rust (*P. pseudozoogleae*) [ibid., 16, p. 413], wilt (*P.* [*Xanthomonas*] *solanacearum*) [ibid., 27, pp. 117, 264, 390; 29, p. 125], soft rot (*Erwinia carotovora*) [ibid., 14, p. 658], stem rot (*E. aroideae*) [*E. carotovora*: ibid., 18, p. 481; 21, p. 325; 27, p. 514], root tumours due to *Bacterium tumefaciens* [see preceding abstract], 'pellagra', attributed by Comes to *Bacillus caulivorus* [cf. ibid., 6, pp. 147, 731], tracheobacteriosis (*P. xanthochlora*) [cf. ibid., 15, p. 680], canker, attributed by Delacroix to *P. aeruginosa* [ibid., 22, p. 377], collar rot, attributed by Delacroix to *B. tabacivorus* [ibid., 16, p. 230], and 'ryaboukha' (*X. heterocea*) [ibid., 10, p. 628; 16, p. 302]. The chief morphological features of these organisms are illustrated comparatively.

Koek (P. C.). **Een voor Nederland nieuwe Tabaksziekte veroorzaakt door Fusarium oxysporum var. nicotianae.** [A Tobacco disease new to Holland caused by *Fusarium oxysporum* var. *nicotianae*.]—*Meded. Direct. Tuinb., Wageningen*, 13, 12, pp. 895–899, 6 figs., 1950. [English summary.]

From the roots of wilted Havana Connecticut tobacco plants at the Stichting Proeftuin voor Tabak, Wageningen, the author isolated in June and July, 1950, a fungus which was identified on the basis of its morphological and cultural characters as *Fusarium oxysporum* var. *nicotianae* [*R.A.M.*, 29, p. 124], a new record for Holland. White Burley plants inoculated with the pathogen developed symptoms of the wilt after a fortnight. Control measures should include the cultivation of resistant varieties and the use of healthy seedlings from uncontaminated, steam-sterilized seed-beds.

Walter (J. M.). **The influence of mosaic on yield of staked Tomatoes.**—Abs. in *Phytopathology*, 40, 8, p. 791, 1950.

A factorial split-plot field study of tomato mosaic involved (1) three viruses, namely, tobacco mosaic [*R.A.M.*, 29, p. 387], tobacco etch [ibid., 20, p. 85], and

cucumber mosaic [ibid., 28, p. 252]; (2) early, late, and no inoculation; (3) three chemical sprays, viz., malachite green at 1 in 4,000, zinc sulphate at 1 in 800, and copper A at 1 in 200; and (4) two lines resistant to wilt [*Fusarium bulbigenum* var. *lycopersici*], W 185–6 and MSTW 210–5, the latter resistant also to tobacco mosaic. All the plots were sprayed weekly with parathion [ibid., 28, p. 393], but mosaic developed here and there at mid-season and by the end of the summer there were 8·71 per cent. rogues from non-inoculated plots. Roguing proved ineffectual because of the impossibility of early detection of diseased plants. All symptomatic fruits were graded as culls in the differentiation between marketable and total yields, neither of which was influenced by malachite green. Zinc sulphate significantly reduced the total output of W 185–6, but did not affect that of MSTW 210–5 or the marketable yield of either line. Time of inoculation did not influence the marketable yield of MSTW 210–5, but early inoculation reduced that of W 185–6 to about half of that in the late inoculated sections, which was in turn less than half the marketable yield from the [? uninoculated] controls. The three viruses were equally injurious to W 185–6. Tobacco etch and cucumber mosaic caused equal damage to MSTW 210–5, which was not harmed by tobacco mosaic.

Michelbacher (A. E.), Gardner (M. W.), Middlekauff (W. W.), & Walz (A. J.). **Field dusting with DDT to control thrips and spotted wilt in Tomatoes.** —*Plant Dis. Reptr*, 34, 10, pp. 307–309, 4 graphs, 1950. [Multilithed.]

In 1946, 1947, and 1949 tomato fields near Mt. Eden, California, where tomato spotted wilt virus [*R.A.M.*, 30, p. 18] is common, were dusted five or six times with DDT to control the thrips [*Thrips tabaci*] vectors. In the first two years excellent control was secured, but disease reduction (10 to 7 per cent. in 1946 and 21 to 15 in 1947) was not at all proportional to it. This may be explained by assuming that infection was brought in by migratory thrips from outside sources.

Bhide (V. P.). **Utilization of organic nitrogen by Corynebacterium michiganensis (E.F.S.) Dowson and its possible bearing on parasitism.**—*Indian Phytopathology*, 2, 2, pp. 173–175, 1949. [Received October, 1950.]

A study was made at Iowa State College of nitrogen utilization by ten re-isolates of CM-6, a weakly virulent strain of *Corynebacterium michiganense* [*R.A.M.*, 28, p. 621], and four of 7433, a highly virulent strain. The isolates of CM-6 failed to grow on solid and liquid synthetic media plus various organic nitrogen compounds [loc. cit.], but those of 7433 grew in one week on media containing aspartic and glutamic acids. When, however, 1 per cent. dextrose was used as a source of carbon, 7433 was able to utilize a number of amino acids, but not tryptophane, argenine, creatinine, choline, or para-amino-benzoic acid. On the other hand only aspartic and glutamic acids were utilized by all the isolates of CM-6. Of the remaining compounds only leucine was utilized by three of the ten isolates.

In experiments in which Bonny Best tomato seedlings were inoculated with all 14 isolates the four of 7433 caused characteristic leaf-wilting while those inoculated with CM-6 developed only slight stunting. These results indicate a possible correlation between the virulence of *C. michiganense* and its ability to utilize organic nitrogen compounds, especially amino acids, as sources of nitrogen for growth.

Bailey (D. L.). **Studies in racial trends and constancy in Cladosporium fulvum Cooke.**—*Canad. J. Res.*, Sect. C, 28, 5, pp. 535–565, 1 pl., 1 map, 1950.

This is the full account of studies on the physiologic races of *Cladosporium fulvum* in south-western Ontario, a preliminary abstract of which has already been noticed [*R.A.M.*, 28, p. 493]. So far seven races differing in their host reactions have been isolated. Vetomold tomato is susceptible to races 5, 6, 7, and 8; V-121 to 6, 7, and 9; Stirling Castle to 2, 6, and 8; V-473 [ibid., 29, p. 631] to 6 and 8; the

Vineland strain of Red Currant tomato (*Lycopersicon pimpinellifolium*) to 6 and 7; while the Red Currant numbers 160 and H 11–22–15M, *Lycopersicon hirsutum*, and its variety *glabratum* are either resistant to or immune from all the races. Race 7, which succeeded race 5 [ibid., 21, p. 122], is now predominating in the commercial greenhouses in the area under study. Race 1 [ibid., 16, p. 572] is at present very rare and was found only on old, susceptible varieties such as Grand Rapids or Sutton's Best-of-all. Race 6 was first isolated at the Vineland Horticultural Experiment Station in 1940, but has never become general. From the Vineland houses and from a limited number of other greenhouses race 8 has been recovered; it seems to be a derivative of race 5. Race 9 has been collected only once, from the vicinity of Toronto in 1947, and it is possible that it has been derived from race 7. Only race 9 can be readily distinguished on artificial culture media; on both malt extract and potato dextrose agars cultures remain greyish-white much longer than those of the other races and then become chalky green (much paler than other cultures); they do not develop the purple colour characteristic of other strains on dilute malt agar.

The mutants of *C. fulvum* which appear consistently after about four weeks in culture fall into two groups, the white and the buff types. They mostly have a reduced sporing potential; they are as pathogenic as or slightly less so than the parent.

Ellis (D. E.) & Garriss (H. R.). **Control Tomato late blight.**—*Ext. Circ. N.C. Coll. Agric.* 331, 10 pp., 2 figs. (1 col.), 2 graphs, 1950.

In this revised edition of the circular on tomato blight (*Phytophthora infestans*) [*R.A.M.*, 28, p. 551] the authors recommend that disease-free plants should be grown, the plant bed should be sprayed or dusted [loc. cit.] once a week and after heavy rain, land planted with potatoes the year before should not be used, and tomato and potato plants should be kept apart [cf. ibid., 29, p. 439]. In western North Carolina the first spray or dust application should be made as soon as the plants are growing well after transplanting. In central and eastern parts of the State applications should start when the first fruit is set and follow at least every ten days. Autumn crops should be treated weekly as soon as cool weather sets in. In 1949 tests at Hendersonville on Marglobe tomatoes with tribasic copper sulphate spray and dust resulted in a yield of 356 bush. per acre compared with 30 bush. for the untreated.

Skovsted (A.). **The Thelephoraceae of Denmark. I. The genus Tomentella.**—*C. R. Trav. Lab. Carlsberg*, Sér. physiol., 25, 1, 34 pp., 18 figs., 1950.

Included in this critically annotated list of 18 species of *Tomentella* collected on various kinds of hard- and softwoods in Denmark are one new species, three new combinations, and two new names. An emended diagnosis of the genus and a key to the species are supplied.

Schwerdtfeger (F.). **Grundriss der Forstpathologie.** [Outline of forest pathology.] —xii+197 pp., 100 figs., 3 diags., 36 graphs, Berlin, Paul Parey, 1950. D.M. 13.60.

This is an abridged edition of the author's treatise on forest diseases (1944) and pests, a note on which has already appeared [*R.A.M.*, 24, p. 255]. The book is divided into four main parts, namely, (I) individual forest diseases (special forest pathology), comprising sections on diseases induced by meteorological conditions, soil properties, human agencies, and members of the forest community; (II) origin, course, and effects of forest diseases (general forest pathology), including prerequisite conditions for disease on the part of the pathogen and the forest, course and symptoms, and economic effects of the diseases; (III) prevention and control of

forest diseases (forest protection), consisting of forest hygiene, diagnosis, and prognosis of forest diseases, and forest therapy.

Caroselli (N. E.). **Several fungus diseases of Elm.**—*Sci. Tree Top.*, 1, 10, pp. 85–88, 1949. [Received December, 1950.]

Brief notes are given in popular terms on the symptoms of a number of elm diseases occurring in the United States, including the leaf spots due to *Gloeosporium ulmicola* [*R.A.M.*, 20, p. 610], *G. inconspicuum* [loc. cit.], and *Gnomonia ulmea* [ibid., 23, p. 370]. Among the 13 fungi listed as occurring frequently on elms are *Fumago vagans* [cf. ibid., 27, p. 502] causing black mould, *Polyporus sulphureus* [cf. ibid., 28, p. 336] (brown-checked wood rot), *Microsphaera alni* [cf. ibid., 19, p. 364; 28, p. 594] and *Phyllactinia corylea* [cf. ibid., 26, p. 155] (powdery mildew), and *Pleurotus ostreatus* [cf. ibid., 22, pp. 2, 232] (white flaky rot).

Caroselli (N. E.). **Use of chemotherapy for the control of the Dutch Elm disease.**—*Sci. Tree Top.*, 1, 10, pp. 88–89, 1949. [Received December, 1950.]

'Carolate', a medicated alkalizer developed as a result of researches at the Bartlett Tree Research Laboratories, Stamford, Connecticut, has been released to the public in limited quantities for experimental use in the chemotherapeutic control of Dutch elm disease [*Ceratostomella ulmi*: *R.A.M.*, 29, p. 543].

Fergus (C. L.). **An epiphytotic of White Oak anthracnose in central Pennsylvania.** *Plant Dis. Reptr*, 34, 10, pp. 292–293, 1950. [Multilithed.]

In 1950 a severe epidemic of anthracnose of *Quercus alba*, caused by *Gnomonia veneta* [*R.A.M.*, 20, pp. 183, 611], occurred in central Pennsylvania. Many white oaks at the Pennsylvania State College exhibited the characteristic symptoms as early as May. Trees in park areas and on lawns suffered much more than those under forest conditions. A similar epiphytotic occurred in 1944 and from a comparison of meteorological data for both years it was found that each had a mild winter, delayed spring with deep snow cover in March, and moderate, fairly continuous rains during April and May with little sunshine.

Bretz (T. W.) & Long (W. G.). **Oak wilt fungus isolated from Chinese Chestnut.**—*Plant Dis. Reptr*, 34, 10, p. 291, 1950. [Multilithed.]

Chalara quercina has been isolated from five chestnut trees (*Castanea mollissima*) showing various stages of defoliation and top necrosis in a 12-year-old plantation in Missouri; oak wilt is present in the locality [*R.A.M.*, 29, p. 544; 30, p. 142]. Chinese chestnuts in a planting near by showed no evidence of the disease.

Chestnut blight caused by the fungus Endothia parasitica.—*For. Comm. Bookl.* 3, 4 pp. (unnumbered, text on inside covers), 4 col. pl., 1950. 2*s.* 6*d.*

A description is given of the symptoms of chestnut blight (*Endothia parasitica*) [*R.A.M.*, 29, p. 545] to facilitate prompt recognition should the disease reach England. Four coloured plates illustrate the cankers and other symptoms. Under the Importation of Forest Trees (Prohibition) Order 1949, importation of living chestnut trees into the British Isles is prohibited except under licence.

Miller (P. W.). **You can control Walnut blight.**—*Rep. Ore. St. hort. Soc., 1949*, pp. 105–106, 1949. [Received October, 1950.]

Unsatisfactory control of walnut blight [*Xanthomonas juglandis*: *R.A.M.*, 28, p. 601] may result from too few spray or dust applications, improper timing, or poor coverage [ibid., 28, p. 94]. The importance of correct timing is illustrated by the fact that one half of an orchard given the early post-blossom application just before prolonged rains developed only 5·4 per cent. infection, as against 51·5

per cent. for the half sprayed five days later. To obtain good coverage the trees should always be sprayed or dusted from both sides. Dusting should be done in the early morning before the wind rises. Twenty years' experiments have shown that the recommended programme will give commercial control if properly carried out.

Toole (E. R.). **Soil treatments against the Mimosa wilt Fusarium.**—Abs. in *Phytopathology*, 40, 8, p. 791, 1950.

In laboratory and greenhouse tests during 1949 on a number of chemicals of potential value in soil treatment for the control of mimosa (*Albizzia julibrissin*) wilt (*Fusarium oxysporum* f. *perniciosum*) [*R.A.M.*, 29, p. 589], four showed sufficient promise for further trials. They were consequently applied at dosages of 100 lb. per acre to infested soil in greenhouse plots in which susceptible seedlings were planted at the time of treatment. On sampling 44 days later, reduction in the incidence of the pathogen was 100 per cent. for ferbam, 85 per cent. for phygon, 55 per cent. for puratized, and 25 per cent. for oxyquinoline benzoate, the corresponding percentages of wilted tree seedlings being none, 33, 25, and 33, compared with 63 in the controls.

Gaudineau (M[arguerite]). **Les champignons parasites du Pin maritime.** [The parasitic fungi on the Maritime Pine.]—Reprinted from *Cah. Ingén. Agron.*, 4, pp. 44–52, 4 figs., 1949. [Received October, 1950.]

From more recent studies, particularly those carried out in the United States since 1932, a description is given of the symptoms, methods of penetration, propagation, host range, varietal susceptibility to and control of the principal diseases affecting seedlings, young and adult trees, and felled specimens of the maritime pine [*Pinus pinaster*].

Thomas (G. P.). **Two new outbreaks of Phomopsis lokoyae in British Columbia.**—*Canad. J. Res.*, Sect. C, 28, 5, pp. 477–481, 2 pl., 1 map, 1950.

In 1949 Douglas fir (*Pseudotsuga taxifolia*) saplings in two widely separated localities in British Columbia were affected by stem and branch canker and leader die back (*Phomopsis lokoyae*) [*R.A.M.*, 18, p. 827; 21, p. 544]. At Haney, in the lower Fraser Valley, the outbreak was on Pacific Coast Douglas fir on good land and covered about 10 acres, while the second, some 300 miles distant, occurred on Rocky Mountain Douglas fir on low site land in the Interior Forest and extended for 23 miles. The fungus was active during a single dormant season in the bark and cambium tissues following infection during late summer. The attack occurred after heavy summer rainfall in 1948 followed by an unusually long and severe winter. Although recurrent outbreaks may be anticipated, *P. lokoyae* is not considered of major importance in the Pacific Northwest.

Dominik (T.). **Modrzew w lasach czerniejewskich pod Gnieznem i dynamika rozwojowa jego mykorhizy.** [The Larch in the Czerniejewo forests near Gniezno and the intensity of the development of its mycorrhiza.]—*Acta Soc. Bot. Polon.*, 30, 1, pp. 305–330, 1 pl., 6 figs., 7 diags., 1950. [French summary.]

The results are presented of anatomical studies on the mycotrophic rootlets of the Polish larch (*Larix polonica*) [*R.A.M.*, 24, p. 463], associated with *Boletus elegans* and *B. erythropus*, in the forests of Czerniejewo, near Gniezno, western Poland. The trees all bore typical ectotrophic mycorrhiza, possessing normal root tissues as well as the mycelium which is closely combined with the primary cortex. During their development the ectotrophic mycorrhiza pass through a peritrophic stage [ibid., 14, p. 247] confined to the root cap zone. Endotrophic mycorrhiza develop only in the absence of more suitable fungi. A description is given of a

method for propagating larch races adapted to soils with symbiotic fungi [see above, p. 234] by establishing a larch nursery on virgin soil with seedlings and soil from the Czerniejewo nursery.

Schubert (W. J.) & Nord (F. F.). **Investigations on lignin and lignification. II. The characterization of enzymatically liberated lignin.**—*J. Amer. chem. Soc.*, 72, 9, pp. 3835–3838, 2 graphs, 1950.

In further studies at Fordham University, New York, the native lignin of white Scots pine was isolated and identified [*R.A.M.*, 29, p. 445]. After 15 months of decay of this wood by *Poria vaillantii*, 22·7 per cent. of the residual lignin was isolated by alcoholic extraction, while after 13 months of decay by *Lenzites sepiaria* 18·3 per cent. was obtained. The lignin liberated from the wood by the enzymatic activity of the fungi was identical with native lignin. The nature of the linkage between lignin and cellulose in softwoods is discussed.

Czaja (A. T.). **Stalaktiten-Fruchtkörper von Merulius lacrymans var. domesticus.** [Stalactite fruit bodies of *Merulius lacrymans* var. *domesticus*.]—*Arch. Mikrobiol.*, 15, 1, pp. 176–178, 1 fig., 1950.

From the familiar flat fruit bodies of *Merulius lacrymans* var. *domesticus* [*M. lacrymans*] on the ceiling of a cellar at Aachen, Germany, hung parallel rows of mycelial elements up to 6 cm. long, some spherical, others more conical. The hymenium covering the upper part of the surface of these stalactite-like structures presented the typical 'honeycomb' appearance, but its extension assumed a setiferous or denticulate hydnoid form, the teeth being 5 to 8 mm. long. The formation by *M. lacrymans* of these unusual fruit bodies is attributed to the influence on its physiology of protracted exposure to dripping water.

Roosen (P.). **De la pénétration des antiseptiques dans le bois.** [The penetration of antiseptics into wood.] —*Bull. Inst. agron. Gembloux*, 18, 1–2, pp. 143–163, 2 pl., 1 fig., 1 diag., 2 graphs, 1950. [Flemish, German, and English summaries.]

From this review of timber preservatives, their methods of application, the structure of different types of timber in relation to penetration, and pre-preservation treatment, the author concludes that deep penetration for durable preservation, while depending on the kind of preservative used and the mode of application, is also affected by the species, the anatomical structure of the wood, and the changes that have been brought about by seasoning. At present only pressure methods are adequate for exterior woodwork. Methods of application better suited (than those now employed) to the different structures of the various species are desirable. The intensity and duration of the pressures applied are at present based solely on practical experience, and exact data, experimentally obtained, would assist in solving many difficulties. Research on preservatives should consider their technological properties in relation to the details of the constitution of the material to be treated.

Grindrod (J.). **A Swedish method of wood preservation.**—*Chem. & Indust., 1950*, 38, p. 668, 1950.

Particulars are given of the method of timber preservation with a mixture of sodium bichromate, sodium arsenate, and arsenic acid developed in Sweden by the Boliden Mining Company [*R.A.M.*, 24, p. 394; 27, p. 208] and used at a concentration of about 3·5 per cent. total salts by weight. The impregnating solution must not be warmed above 48° C. After the cylinder has been charged a vacuum of about 24 in. mercury is drawn and held for such time as is required by the properties of the wood being treated—normally 20 to 40 minutes for Swedish pine [*Pinus sylvestris*]. Then the solution is drawn off into the cylinder and the pressure con-

tainer by the vacuum, after which the pressure period is maintained (in the case of Swedish pine) at 100 lb. per sq. in. for one to three hours, followed by renewed withdrawal of the solution and the application of a short final vacuum. Absorption of the solution is about 18 lb. per cu. ft., so that at 3·5 per cent. timber for dry land absorbs normally an average of 0·65 lb. total salts per sq. ft., the fixation of which is considered complete after a fortnight's seasoning.

Tests on wood thus treated have shown that strength and electrical resistance are not impaired, while protection against fungal rots was found to be quite effective in tropical climates. The Swedish Government makes wide use of the treatment, which has been applied since 1940 to more than 2,000,000 sleepers and 5,000,000 cu. ft. of poles. At 53 plants throughout the country timber for private consumers is treated by the Boliden method, which is attracting attention abroad. The doubling or even trebling of life and durability by the treatment gives the wood a much higher initial value. It has been estimated that 8 per cent. of all timber used is destroyed annually by fungi alone, representing in the United States a sum of over $250,000,000.

Hewitt (E. J.) & Jones (E. W.). **Molybdenum as a plant nutrient. II. Effect of molybdenum deficiency on some Brassica crops.**—*Rep. agric. hort. Res. Sta. Bristol, 1949*, pp. 58–63, 2 pl., [? 1950].

Continuing their investigations on molybdenum deficiency in plants [*R.A.M.*, 29, p. 54] the authors found that when cauliflower [ibid., 30, pp. 8, 133], hungrygap kale, marrowstem kale, rape, savoy cabbage, Brussels sprouts, and swede were grown in sand culture deficient in molybdenum all these crops developed severe molybdenum deficiency symptoms, especially in the seedling stage; yields were reduced by 90 per cent. or more (except in savoy) and mortality was high. Susceptibility, judged visually and from yield and mortality data, was highest in swede, followed in descending order by sprouts, hungrygap kale, cauliflower, rape, marrowstem kale, and savoy. The visual symptoms of molybdenum deficiency on these plants are described in an appendix.

Bhide (V. P.). **Stomatal invasion of Cabbage by Xanthomonas campestris (Pammel) Dowson.**—*Indian Phytopathology*, 2, 2, pp. 132–133, 1949. [Received October, 1950.]

In attempts to induce stomatal invasion of cabbage leaves by the black rot organism (*Xanthomonas campestris*) [*R.A.M.*, 28, p. 621; 29, p. 548] in the Botany and Plant Pathology Department, Iowa State College, using sodium oleate in gelatin [ibid., 26, p. 315], it was found that the organism could withstand a concentration of 0·05 per cent. sodium oleate in 0·25 per cent. gelatin water for 72 hours. Early Jersey Wakefield cabbage seedlings with four leaves each were sprayed with suspensions of *X. campestris* in sterile 0·25 per cent. gelatin solution plus 0·01, 0·03, and 0·05 per cent. sodium oleate. The seedlings were kept in a moist chamber for 72 hours before and after spraying. Five days later two plants on which 0·03 per cent. sodium oleate was used showed symptoms of stomatal invasion by the bacteria, indicated by spots on the leaves away from the margins. In ten days all the plants developed marginal lesions from hydathode invasion. *X. campestris* was readily isolated from both types of lesion. On several two-week-, one-month-, and two-month-old plants bacterial suspensions in 0·03 per cent. sodium oleate induced numerous stomatal and marginal lesions in seven days, more stomatal lesions being present on the older plants than on the younger ones. On the leaves of one- and two-month-old plants the spots were about 1 to 2 mm. in diameter with dead, brown centres. On younger plants they were small, yellow areas. In no case did the stomatal spots enlarge. Hydathode infection was severe in plants

of all ages; the lesions soon covered most of the leaf surface and progressed downwards in the petioles and stems.

Deshmukh (N. Y.) & Mahmud (K. A.). **Damping-off of Cabbage seedlings caused by Rhizoctonia (Corticium) solani Kuhn.**—*Mag. agric. Coll. Dharwar*, 4, 1, pp. 12–13, 1950.

Of 100 cabbage seedlings that succumbed to damping-off at Nagpur in September, 1949, 63 yielded *Pythium aphanidermatum* [*R.A.M.*, 29, pp. 341, 597] and the remainder *Corticium solani* [ibid., 22, p. 494], the latter a new record on this host for India. The pathogenicity of the fungus was demonstrated by soil inoculation experiments, in which 79 per cent. of the seedlings developed the disease, *C. solani* being reisolated from the infected tissues.

Sylvester (E. S.). **Transmission of Brassica nigra virus by the green Peach aphid.**—*Phytopathology*, 40, 8, pp. 743–745, 1950.

Replicated tests at the University of California, Berkeley, on the transmission of Takahashi's mustard (*Brassica nigra*) virus [*R.A.M.*, 30, p. 207] by *Myzus persicae* indicated that an infective charge of virus can be acquired during six to ten seconds of infection feeding, and a healthy plant can be effectively inoculated within the first five seconds of the test feeding period. Using optimal values (20 seconds) for both the acquisition and inoculation thresholds, a transmission threshold value was obtained, with a mean of about one minute and a minimum of just over 30 seconds.

The significance of these observations lies in the fact that the mustard virus resembles potato virus X in shape and size. No evidence of the transmissibility of the latter virus by aphids or other insects is as yet forthcoming. From the present experiments it appears that the form and dimensions of the virus particle are not decisive factors in determining the capacity of aphids to carry the disease from infected to healthy plants.

Gendron (Y.) & Limasset (P.). **Titrages sérologiques du virus de la jaunisse de la Betterave (Corium betae Holmes) dans les organes aériens de Betteraves industrielles et de porte-graines infectées.** [Serological titres of Beet yellows virus (*Corium betae* Holmes) in the aerial organs of industrial Beets and infected seed-bearers.]—*C. R. Acad. Sci., Paris*, 231, 16, pp. 792–793, 1950.

Contrary to the findings of Kleczkowski and Watson as to the paucity of beet yellows virus in young as compared with old leaves of sugar beets [*R.A.M.*, 23, p. 420], the present writers found that the young organs (leaves, axillary shoots, and stems at the level of the leaves) of seed-bearers infected the previous year in France were richer in virus antigen (taken to be identical with the virus itself) than the older ones.

Thomas (H. R.) & Zaumeyer (W. J.). **Red node, a virus disease of Beans.**—*Phytopathology*, 40, 9, pp. 832–846, 3 figs., 1950.

When first observed in Colorado in 1938, the red node virus disease of beans (*Phaseolus vulgaris*) [*R.A.M.*, 29, p. 600] was attributed to a physiological breakdown [ibid., 24, p. 260]. In 1943 a virus closely allied to that of bean yellow mosaic [ibid., 23, p. 1] was suggested, but since the red node virus is infectious to cucumber and tobacco [ibid., 29, p. 284] it cannot be related to this group. The results of comparative studies on red node and certain other viruses reported to cause systemic infection of both tobacco and bean, viz., tobacco ring spot and streak [ibid., 28, p. 491; 29, p. 345], tomato ring spot [ibid., 28, p. 492], and lucerne virus N (abs. in *Phytopathology*, 39, p. 861, 1949), indicated that the red node virus is a strain of

the tobacco streak virus and is accordingly designated *Annulus orae* H. var. *phaseoli* n. var.

Red node is irregularly distributed through the bean-growing areas of Colorado, Idaho, and Wyoming. Additional hosts of the virus [ibid., 29, p. 488], infected by mechanical transmission with carborundum, are *Nicotiana rustica*, *Datura stramonium*, *Cyamopsis tetragonoloba*, Perfection pea, crimson and red clovers, Broad Windsor broad bean, vetch, Chinese Red cowpea, *Vigna sesquipedalis*, Biloxi soy-bean, lupins (*Lupinus albus* and *L. angustifolius*), *Phaseolus aconitifolius*, *P. aureus*, and *P. mungo*.

No evidence was obtained of the transmission of the red node virus through the seed. None of the 25 bean varieties inoculated with the virus gave any sign of resistance.

The thermal inactivation end point of the red node virus was found to lie between 56° and 58° C. and that of tobacco streak between 54° and 56°. Both viruses tolerated a dilution of 1 in 500 but not of 1 in 1,000. The red node virus was slightly infectious after storage *in vitro* at 18° for more than 24 but less than 48 hours, while that of tobacco streak lost its infectivity within 24 hours. Both viruses were rapidly inactivated within 20 minutes after extraction. Both withstood 30 days' desiccation but only the tobacco streak virus withstood 90 days.

The identification of red node with the tobacco streak virus is based on similarity of properties, symptoms on beans and other hosts, and limited cross-protection tests. The varietal distinction rests on the slightly higher thermal inactivation end point of red node, its failure to infect *N. glutinosa*, and the absence on the tolerant young growth of tobacco and *D. stramonium* recovering from an attack by this virus of the holly leaf margin characteristic of tobacco streak.

Bain (D. C.). **Studies of southern Bean mosaics in Mississippi.**—Abs. in *Phytopathology*, 40, 8, p. 786, 1950.

A pod-mottling and distorting virus disease of beans [*Phaseolus vulgaris*] is very prevalent in poorly drained areas of autumn-planted Stringless Black Valentine in the Crystal Spring district of Mississippi. Mottling on some or all pods of a plant may resemble that caused by the southern bean mosaic viruses 4 and 4A [*R.A.M.*, 23, p. 203]. Local infection developed on Stringless Red Valentine, Top Notch Golden Wax, Giant Stringless Green Pod, Bountiful, Stringless Refugee, Contender, Logan, Idaho Refugee, U.S. No. 5 Refugee, White Half Runner, and Striped Creaseback; in French Horticultural and Pencil Pod Wax the virus was systemic; Woods Prolific Lima [*P. lunatus*], Henderson Bush Lima, and Florida Belle remained immune. Full Measure, Dwarf and London Horticultural, and Plentiful contracted systemic infection without pod-mottling. At 16° C. local and systemic symptoms appear in five and ten days, respectively. Local infection developed on Ideal Market inoculated with juice heated to 93° for ten minutes or diluted 1 in 500,000. Systemic symptoms (pod-mottling) were induced in Stringless Black Valentine with juice heated to 80° or diluted 1 in 1,000. The virus, possibly a strain of one of the southern bean mosaics, does not appear from limited tests to be seed- or soil-borne.

Zaumeyer (W. J.) & Thomas (H. R.). **Yellow stipple, a virus disease of Bean.**—*Phytopathology*, 40, 9, pp. 847–859, 4 figs., 1950.

The yellow stipple virus (*Marmor flavopunctatum* n.sp.), isolated from Stringless Black Valentine beans (*Phaseolus vulgaris*) originating in Illinois, is described and compared with the associated viruses, southern bean mosaic [see preceding abstract] and pod mottle [*R.A.M.*, 29, p. 549]. Yellow stipple virus produces a mild foliar mottling and, on most dry bean varieties, such as Great Northern and Pinto, small, chlorotic spots which may coalesce to form irregular patches up to 10 mm.

in diameter, while veinal and stem necrosis are of common occurrence. These symptoms appear to be identical with those of 'yellow spot', referred by Parker to hereditary chlorophyll deficiency (*J. Hered.*, 24, pp. 481–486, 1933).

None of the 36 bean varieties inoculated with yellow stipple virus was resistant, and all pea, soy-bean, and cowpea varieties contracted either local or systemic infection. *Cyamopsis tetragonoloba* and *Phaseolus acutifolius* were the only other susceptible species among 31 representing 20 genera in seven families.

Ten minutes' heating of the juice at 72° to 75° C. inactivated the virus and the dilution end point lay between 1 in 50,000 and 1 in 75,000. It withstood five days' ageing *in vitro* at 18° and was still active in dry tissue after 80 days' storage at the same temperature.

On the Tendergreen, Plentiful, and Stringless Black Valentine bean varieties the symptoms induced by a combination of yellow stipple and southern bean mosaic viruses were more intense than those caused by each virus alone. Combination with pod mottle virus, however, or with this virus and southern bean mosaic did not intensify the symptoms of yellow stipple.

Boosalis (M. G.). **Studies on the parasitism of Rhizoctonia solani Kuehn on Soy-beans.**—*Phytopathology*, 40, 9, pp. 820–831, 5 figs., 1950.

Field surveys have indicated that the root rot caused by *Rhizoctonia* [*Corticium*] *solani* is a potentially destructive disease of soy-beans [*R.A.M.*, 28, p. 155] in Minnesota. Two factors that may affect its incidence are the seasonal variation of environment and physiologic specialization within the species [ibid., 1, p. 202; 4, p. 518; 14, p. 207; 20, p. 591; 24, p. 469]. In controlled soil-temperature experiments races 14 and 1 caused most damping-off at 25° to 29° C. (95 and 100 per cent., respectively), the disease ratings of the former on five varieties ranging from 1 (superficial lesions not involving the epidermal layer) to 3 (lesions involving three to six cortical cell layers), and of the latter from 3·5 to 4 (lesions involving vascular elements and often girdling stem or root). Neither strain caused appreciable damage at 14°. At 19° and 21° the reductions in stand due to isolates 1 and 14 were 15 and 10 per cent., respectively, while at the maximum temperature of 33° both were responsible for losses of 60 to 70 per cent. It appears from laboratory and field studies that certain isolates can parasitize germinating soy-bean seeds and seedlings, their toxins acting on the host tissue at a distance. The diluted filtrates of the highly pathogenic isolate 1 reduced seed germination and inhibited seedling root development in the Minsoy variety, but no such effect was exerted by the weakly parasitic strain 6. There were only minor differences in the reactions of five test varieties to the 16 isolates included in the experiments. The incidence of damping-off in plots of the Minsoy variety was considerably reduced by seed treatment with spergon or ceresan M at the rate of 2 oz. per bush., the former raising the percentages of emergence in the spring and autumn from 32 to 92 and 20 to 86, respectively, while the corresponding figures for the latter were 84 and 78.

In comparative studies of six isolates of *C. solani* no correlation was discerned between the cultural characters of the several isolates and their pathogenicity to soy-bean.

Weiss (M. G.). **The Soybean improvement program.**—*Soybean Dig.*, 10, 11, pp. 34–35, 1950.

Emphasizing the need for extended study on the pathology of soy-beans in connexion with the improvement programme [*R.A.M.*, 27, p. 212], the writer states that types have been discovered showing a high degree of genetic resistance to the bacterial diseases, blight [*Pseudomonas glycines*], pustule [*Xanthomonas phaseoli* var. *sojense*], and wildfire [*P. tabacum*: ibid., 29, pp. 133, 549, 550]. In the south [of the United States], where pustule and wildfire are particularly destructive,

arrangements are in hand for the release of varieties equal to Ogden and Roanoke in respect of agronomic characters and seed composition but resistant to the pathogens, which have caused yield reductions of up to 10 per cent. in plot trials.

Genetic resistance to most of the other diseases affecting the crop is not so clear-cut, but on a recent trip through the south differences in strain reactions to every pathogen observed were apparent. Pending further research, only such varieties will be released as show no marked susceptibility to any of the more serious diseases.

Haasis (F. A.) & Ellis (D. E.). **Effect of fungicidal drenches on incidence of Lettuce downy mildew in the seed bed.**—*Plant Dis. Reptr*, 34, 10, pp. 310–311, 1950. [Multilithed.]

In an experiment carried out in autumn, 1949, with Asgrow Great Lakes and Asgrow Dark Green cos lettuce seedlings near Burgaw, North Carolina, soil drenches of 2–100 dithane Z–78 gave complete control of an epiphytotic of downy mildew (*Bremia lactucae*) [*R.A.M.*, 28, p. 555], which also caused serious losses in isolated propagation frames in January, 1950. Fermate and tersan at the same strength allowed an average disease index of 3·85 and 5·45 compared with 45·74 for the untreated. The first drench treatments were applied on 28th November at the time of seeding and were followed by six weekly applications at the rate of approximately 4·5 gm. ($\frac{1}{2}$ gal.) per sq. yd. soil surface. As the plants made considerable new growth after the last application and before the final disease readings were made 18 days later, the possibility that control accrued from the direct application of the fungicide to the leaves is precluded. Control may be explained, theoretically, by postulating volatilization of the fungicides from the soil and condensation on the leaves, or plant absorption.

Vasudeva (R. S.), Raychaudhuri (S. P.), & Singh (J.). **A new strain of Cucumis virus 2.**—*Indian Phytopathology*, 2, 2, pp. 180–185, 2 figs., 1949. [Received October, 1950.]

During 1947 to 1948 bottle gourd (*Lagenaria leucantha*) plants growing at New Delhi and in the experimental plots of the Division of Mycology were affected by a disease which resulted in general stunting and reduction in flower and fruit production. The first visible symptom was irregular light and dark green leaf mottling developing into a mosaic. A few leaves developed typical green vein-banding. In some plants leaf distortion associated with wavy and irregular margins occurred, especially during the winter. Young leaves exhibited dark green blisters on a wrinkled, pale green surface. Sap inoculation experiments established the virus nature of the disease, the symptoms appearing on inoculated plants in 12 to 18 days in winter and in 6 to 8 days from the end of March onwards. The virus was carried symptomlessly in *Datura stramonium*, *Luffa acutangula*, watermelon, and *Momordica charantia*, and produced visible symptoms only on *Cucurbita moschata* and cucumber in addition to bottle gourd. In *C. moschata* minute green spots appeared 15 to 18 days after inoculation, followed later by small, yellow, circular spots along the veins. Small yellow spots appeared on the youngest leaves of cucumber plants in 7 to 10 days, later enlarging until the whole leaf appeared pale. The growth of both plants was stunted subsequent to infection.

The virus has a thermal death point of 86 to 88° C., a dilution end point of 1 : 1,000 in standard extract and 1 : 10,000 in pure sap, and a longevity *in vitro* of more than 90 days. It differs from cucumber green-mottle mosaic [*R.A.M.*, 14, p. 554; 29, p. 244] in its inability to cause visible symptoms on watermelon and in its ability to infect *D. stramonium*; from Vasudeva and Lal's bottle gourd mosaic [ibid., 28, p. 153] in its greater longevity, higher thermal death point, and tolerance of dilution; and from *Cucumis* virus 2B detected in bottle gourd by Capoor and Varma [loc. cit.] in its higher thermal and dilution end points and host range. It is

proposed, therefore, to designate it as *Cucumis* virus 2C [a strain of cucumber green-mottle mosaic] or *Marmor astrictum* var. *subobscurum* n.var.

Nema (K. G.) & Mahmud (K. A.). **Damping-off of Brinjal seedlings caused by Rhizoctonia (Corticium) solani Kuhn.**—*Mag. agric. Coll. Nagpur*, 25, 1–2, pp. 1–2, 1950.

Corticium solani was isolated from the root system of damped-off eggplant seedlings [*R.A.M.*, 1, p. 302; 17, pp. 161, 217; 18, p. 370; 29, p. 492] at Nagpur in July, 1948, the first record of its occurrence on this host in India. In inoculation experiments in autoclaved soil 27 per cent. of the seedlings developed the symptoms of the disease within 12 days of germination, and the fungus was reisolated from them.

Patel (M. K.), Qureshi (I. M.), & Bhide (V. P.). **First record of Verticillium wilt in India.**—*Indian Phytopathology*, 2, 2, pp. 245–246, 1949. [Received October, 1950.]

Verticillium wilt was first observed in India during 1938 on a plot of eggplants at the Agricultural College Farm, Poona. The disease has been reported since from several other localities in Bombay State, causing heavy mortality to the crop and often destroying it entirely. Plants affected when young become stunted and generally do not flower or fruit. When infection takes place after fruiting the buds and fruits become distorted and flaccid and finally drop off. The lower leaves wilt from one margin to the other and eventually fall, while in some cases the initial stage of infection is marked by the presence on the leaf lamina of irregularly scattered, necrotic, pale yellow blotches, which eventually coalesce to cause complete wilting. The disease progresses upwards and may kill the plant. In inoculation tests the fungus attacked eggplant, potato, tomato, bhendi [*Hibiscus esculentus*: *R.A.M.*, 29, p. 497], cotton, dahlia, tobacco, *Datura*, and *Physalis* sp. It closely resembled *V. dahliae* [ibid., 26, p. 451] in its morphological, cultural, physiological and pathological characters, producing abundant black sclerotia. It differed from *V. albo-atrum* in many respects [ibid., 29, p. 333].

Jackson (R. L. O.). **Mushroom growing. A practical manual.**—viii+103 pp., 4 pl., 32 figs., 21 diags., London, English Universities Press, Ltd., 1950. 9*s.* 6*d.*

This well-illustrated, practical handbook embodies a description of the most usual method for the commercial culture of mushrooms in Great Britain, dealing only briefly with other commercial methods. It is concerned with the main problems confronting the amateur grower and the beginner. Diseases and pests and their control are described in Chapter VII (pp. 62–78).

Wahl (I.). **Cultivation of wild forms of the Mushroom Psalliota bispora (Lange) Schäffer and Möller.**—*Phytopathology*, 40, 9, pp. 793–798, 2 figs., 1950.

The cultivated mushroom differs from *Agaricus* [*Psalliota*] *campestris* in that it has two-spored basidia, cystidia on the gill margins, and is able to grow in manure fermented to high temperatures. Two distinct types of the bisporous wild mushroom were collected at University Farm, St. Paul, Minnesota, one with a brownish, scaly cap and a short stem, and the other with a creamy-white, fibrillar cap and a long, slender stem. The latter type diverges in certain respects from the description given by Schäffer and Möller for *P. bispora* (*Ann. mycol., Berl.*, 36, pp. 64–82, 1938), and should perhaps be regarded as a separate variety of the species [cf. *R.A.M.*, 30, p. 80]. The stem is 8 to 9 cm. long and is thus longer than or equal to the diameter of the pileus (5 to 8 cm.), whereas in the species proper the stem (4 to 5 cm.) is equal to or shorter than the diameter of the cap (5 to 9 cm.).

Multispore and tissue cultures of the brown, scaly mushroom grew vigorously in

fermented horse manure. It is very fertile, and the first pilei were produced 27 days after spawning. Some of the cultures derived from the creamy-white variety gave rise, on potato dextrose agar plus uranium nitrate at 0·1 to 0·75 gm. per l., to an abundant mycelium [ibid., 28, p. 374], subcultures of which developed freely on the same medium and yielded sporophores in horse manure beds about six weeks after spawning.

Charrin (V.). **Oxyde de fer et chlorose.** [Iron oxide and chlorosis].—*Progr. agric. vitic.*, 134, 51–52, p. 391, 1950.

During the war, when iron sulphate was all but unobtainable, French growers used iron oxide to remedy iron deficiency chlorosis of the vine [*R.A.M.*, 19, p. 193; 20, p. 516; 24, p. 112]. The unsatisfactory results reported in some cases may have been due to using haematite, which is almost insoluble. Limonite (hydrated iron oxide) should be used, and to be effective during the year of application the particles should not exceed 5 mm. in diameter. When pulverized limonite becomes available in adequate quantities it will no longer be necessary to use the more expensive iron sulphate.

Boubals (D.) & Huglin (P.). **Sur la localisation et la transmission d'une mosaïque nécrotique de la Vigne.** [On the localization and transmission of a necrotic mosaic of the Vine.]—*Progr. agric. vitic.*, 134, 49–50, pp. 343–349, 3 figs., 5 diags., 1950.

The development of a form of mosaic due to infectious degeneration (court-noué) [*R.A.M.*, 28, p. 207; 30, p. 137] on a hybrid 17 Couderc vine at Montpellier was studied over a period of years. On the leaf blade were discoloured dots which sometimes became confluent, forming pale, more or less extensive spots with a brown necrosis usually in the centre. The condition appeared when the twigs were about 10 cm. long. It was visible when the vine was in full growth on the second or third leaf. It was less distinct on older leaves and those of vigorous branches, and most marked on the apical leaves. The adventitious buds were affected and slightly over-developed. Other symptoms of degeneration were doubling of certain leaves and marked opening of the petiolar sinus. The necrotic areas usually developed at the site of stomata. The affected parts of the leaf surface were smooth, shiny, and 'oily'. As a rule the whole surface had some parts with more mosaic than others, where development of the leaf had been obstructed with resultant loss of symmetry. Slight necrosis was sometimes present on the veins, situated usually at or near a stoma. Some clones of 17 Couderc were unaffected, but the condition was seen on Rupestris du Lot, Riparia, Cordifolia, 57R, 99R, and other varieties.

Cuttings from affected 17 Couderc vines always gave affected plants, while those from a healthy one did not. Three-year-old cuttings from an affected 17 Couderc vine and a healthy clone of Rupestris du Lot were intergrafted in January 1949. In the first year the mosaic had passed from the 17 Couderc stock to the Rupestris scion, appearing on the ninth or tenth leaf and all the later ones; cuttings from the scion gave mosaic plants. Couderc scions retained the mosaic when grafted on Rupestris, and after decapitation the latent eyes of Rupestris du Lot developed shoots, the eighth or ninth leaf of which showed mosaic; thus the mosaic had passed from the affected scion to the stock. These results confirm the view that infectious degeneration of the vine is of virus origin.

Thung (T. H.) & Hadiwidjaja (T.). **Het overbringen van viren met behulp van Cuscuta australis R. Br., 1.** [The transmission of viruses with the aid of *Cuscuta australis* R. Br., 1.]—*Tijdschr. PlZiekt.*, 56, 5–6, pp. 349–351, 1950. [English summary.]

The yellow veinbanding mosaic of *Ageratum conyzoides* [*R.A.M.*, 20, p. 605] and witches' broom virus of *Crotalaria*, affecting *C. usaramoensis*, *C. anagyroides*, *C.*

juncea, and *C. striata* [ibid., 17, p. 429], occur spontaneously in Java. Both were experimentally transmitted from diseased to healthy plants by means of *Cuscuta australis*, used for this purpose for the first time [cf. ibid., 24, p. 136 *et passim*].

Zogg (H.), Horber (E.), & Salzmann (R.). **Pflanzenschutz.** *Ex* **Bericht über die Tätigkeit der Eidg. landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon pro 1948–49.** [Plant protection. *Ex* Report on the work of the Federal Agricultural Experiment Station Zürich-Oerlikon for 1948–9.]—*Annu. agric. Suisse*, 51, 4–5, pp. 432–442, 2 figs., 1950.

During the period under review [cf. *R.A.M.*, 29, p. 200], cereals sustained particularly heavy damage from leaf-shrivelling fungi, such as *Septoria nodorum*, *S. tritici* [ibid., 25, p. 155 *et passim*], and *Leptosphaeria tritici* [ibid., 15, p. 201]. Among the rusts, *Puccinia triticina* caused the heaviest losses of wheat in various districts. Wheat mosaic virus [ibid., 29, p. 94] was apparently more prevalent than hitherto supposed. The organism responsible for maize wilt is probably *Bacterium* [*Xanthomonas*] *stewarti* [cf. ibid., 29, p. 463], but its identity has not yet been established with certainty.

Favourable conditions for the development of a potato blight (*Phytophthora infestans*) epiphytotic were provided by the wide extension of the disease in 1948 [ibid., 29, p. 201] and the absence of protracted spells of winter frost in 1949, enabling infected tubers to overwinter in the open. The first outbreaks occurred correspondingly early (first half of June) and were destructive in places, notably in the Berne area. Many stands of the Bintje variety, and some of Ackersegen, newly emerged, were totally destroyed within a few days. The spread of infection was arrested by the onset of dry weather and the prompt application of sprays. *Actinomyces scabies*, which is normally unimportant in Switzerland, was fairly prevalent, especially on Bintje [ibid., 28, p. 114]. Eight notifications of wart disease (*Synchytrium endobioticum*) [ibid., 29, p. 201] were all connected with previous foci of infection. The extermination of the parasite in the heavily infested mountain valley of Einsiedeln [ibid., 28, p. 114] presents considerable economic and technical difficulties, and has not yet been satisfactorily accomplished. The spread of potato virus diseases was comparatively restricted, the multiplication of the aphid vectors having been held in check by the damp, cool conditions prevailing in the summer of 1948. The average percentage of infection in some 2,000 plots was only 6·8, as against 12·7 in the previous year. In contrast to previous seasons, when leaf roll predominated among the serious virus diseases, severe mosaic and streak [virus Y] assumed a relatively prominent position in 1949.

Besides *Cercospora beticola*, *Phoma betae* and *Alternaria tenuis* were of considerable importance as pathogens of sugar beet leaves.

Majid (S.). **Annual Report of the Department of Agriculture, Assam, for the year ending 31st March, 1950. Part II. The grow more food campaign.**—ii+107 pp., 1950.

In the section of this report [cf. *R.A.M.*, 27, p. 411] dealing with plant protection work in Assam in 1949–50 (pp. 36–40) it is stated that in one experiment on the control of *Helminthosporium* disease of rice [*Ophiobolus miyabeanus*: loc. cit.] 24 per cent. increase in yield over the controls resulted from treating the seed before sowing with 6 tolas of yellow cuprocide per 40 seers of seed [1 tola = 11·664 gm.; 1 seer = 0·933 kg.]. Effective control of rice foot rot [*Gibberella fujikuroi*: ibid., 27, p. 314] was given by seed treatment with agrosan GN, ceresan, and semesan used at the rate of 10 tolas per 40 seers. In hilly regions the loss caused to the potato crop by blight [*Phytophthora infestans*: ibid., 29, p. 168] averages 15 to 25 per cent. of the crop, but it is not unusual to find 50 per cent. damaged by the disease. Perenox (2 lb. per 100 gals.), applied when the plants were 6 to 8 in. high

and again 14 to 21 days later, largely controlled the disease and increased the yield by an average of about 23 maunds [1 maund = 37·327 kg.] per acre. The cost per acre, including chemical and labour, amounted to about 32 rupees for the two treatments, while the increased return was 230 rupees per acre.

Mugma [? *Phaseolus aureus*] and matima [? *Vigna unguiculata*] are attacked by *Colletotrichum lindemuthianum* [C.M.I. map No. 177] and *Cercospora cruenta* [cf. *R.A.M.*, 29, p. 192], almost always together. Spraying with Bordeaux mixture (2–2–50) at intervals of 14 to 21 days, beginning before infection appeared, gave effective control, with an average increase in yield of 1 maund per acre. Soil conditions play an important part in aggravating the disease.

Perenox (4 oz. in 10 gals. water) applied early in May and again in the later part of June to about 2,350 citrus plants reduced incidence of wither-tip [*Gloeosporium limetticola*: C.M.I. map No. 119], scab [*Elsinoe fawcetti*: ibid., No. 125], canker [*Xanthomonas citri*: ibid., No. 11 and *R.A.M.*, 13, p. 160; 20, p. 127], and sooty mould [*Capnodium citri*: ibid., 15, p. 496] to less than 5 per cent.; over 95 per cent. of the fruits were free from scab and canker blemishes.

Beknopt jaarverslag van het C.P.V.-Proefstation over 1949. [A brief annual report of the C.P.V.-Experiment Station for 1949.]—*Bergcultures*, 19, 17, pp. 341, 343, 345, 347; 18, pp. 359, 361, 363, 365, 367, 1950.

The foreword to this report of the Indonesian Central Experiment Stations Association is contributed by J. Schweizer. The work of the Central and East Java agricultural division is described by J. C. Van Schoonneveldt and that of West Java and South and West Sumatra by J. S. Vollema. Items of phytopathological interest, besides these already noticed, include the following. Small-scale tobacco selection experiments were initiated by the crossing of local (East-Central) Java races of Kastori with a South African variety resistant to *Phytophthora* [*parasitica* var. *nicotianae*: *R.A.M.*, 21, p. 226]. The urgency of this project was demonstrated by the heavy damage caused by the pathogen, in combination with slime disease [*Xanthomonas solanacearum*: ibid., 28, p. 163], following excessively heavy rain in November. Plants of *Nicotiana glutinosa*, resistant to tobacco mosaic virus [ibid., 27, p. 262; 28, p. 250], were supplied by the Tobacco Institute, Bergerac, France, but were all destroyed by *P. parasitica* var. *nicotianae* or *X. solanacearum*.

The results of tests with 'tree fungus cure' for the control of [unspecified] tapping surface diseases of *Hevea* rubber [ibid., 30, p. 74] showed that the material can be applied in a rather thinner coating than [socony] product 2295 A plus 3 to 5 per cent. carbolineum plantarium [loc. cit.], with which it is equally effective. Mildew [*Oidium heveae*: ibid., 23, p. 289] developed in a virulent form at high altitudes in the West Java–Sumatra area, and the lack of motor sprayers precluded systematic control. The yield reductions due to the disease were particularly noticeable in such highly susceptible clones as BD5 and TJIR16.

Rapin (J.). **Contrôle des produits destinés à la lutte contre la carie du Froment (Tilletia tritici).** [Check of products destined for the control of Wheat bunt (*Tilletia tritici*)].—*Rev. romande Agric., Vitic., Arboric.*, 6, 9, pp. 65–66, 1950.

Tests at the Federal seed-testing station, Mont Calme, Lausanne, with fungicides intended for the control of wheat bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, 26, p. 11; 28, p. 113] were carried out on the variety MC 405B, both healthy and infected seed of which gave 100 per cent. germination. Only 0·2 per cent. copper carbonate and 0·2 per cent. zyma 3 dusts were completely non-injurious. Tillex (0·2 per cent.) retarded germination but did not reduce it. The least injurious of the other dusts were nos. 12 and 14 (both at 0·2) followed by 2 per cent. ceretan dust, and sprinkling

with a 0·2 per cent. solution of 5 per cent. copper sulphate, 0·5 per cent. mercuric chloride, 0·5 per cent. formaldehyde, or panogen [cf. ibid., 29, pp. 90, 95, 413; 30, p. 28].

Fungicidal efficacy was tested by treating infected and clean seed, which was then sown in pots of soil with added spores and later planted in the field. The percentages of infection resulting from healthy untreated grain in clean and infested soil were, respectively, 0 and 26·8 per cent., the corresponding figures for infected untreated seed being 49·7 and 70·6. Seed given 30 minutes' immersion in 1 per cent. copper sulphate, 0·1 per cent. mercuric chloride, and 0·1 per cent. formaldehyde developed 9·7 and 10·8, 0·7 and 20·3, and 0 and 12·8 per cent. bunt, in clean and inoculated soil, respectively. The corresponding figures for sprinkling with 0·2 per cent. panogen, 0·3 per cent. product no. 18, and 0·3 per cent. product no. 19 were, respectively, 0 and 17·4, 0 and 5·9, and 0 and 4·8; and for dusting with 0·2 per cent. zyma 3, product no. 12, product no. 14, and tillex, 0 and 7·2, 0 and 3·8, 0 and 6·9, and 0·4 and 22·2, respectively.

It is concluded that seed treatment against bunt by immersion will probably have to be discontinued. On the whole, sprinkling was not satisfactory, though panogen justified its reputation and products 18 and 19 showed marked fungicidal efficacy though they were somewhat deleterious to the seed. All the dusts tested were more fungicidal than copper carbonate and most were in all respects satisfactory. No treatment gave complete protection of seed sown in infected soil. The inoculum used (spores for 1949 infections) seems to have been a mixture of races, and apparently one race is transmitted by the seed and another by the soil.

JAMALAINEN (E. A.). **Über die Resistenz der in Finnland anzubauenden Getreidesorten gegen Weizensteinbrand und Haferflugbrand.** [The resistance of cereal varieties grown in Finland to Wheat bunt and Oat smut.]—*Maataloust. Aikakausk.*, 18, 2, pp. 45–49, 1946. [Abs. in *Biol. Abstr.*, 23, 5, p. 1719, 1949.]

Tests of many strains and varieties of spring wheat at the Agricultural Experiment Station, Tikkurila, from 1943 to 1945 indicated that all were susceptible to *Tilletia caries* [*R.A.M.*, 28, p. 279] but to different degrees. The most resistant were Kimmo (from the Tammisto Plant Breeding Station) and some new strains from the State Plant Breeding Institute, Jokioinen, having Aurore or Janetzky Früh as one parent. Of the oat varieties Petkuser Yellow was quite free from *Ustilago avenae* [loc. cit.] during 1937 and 1938, while Pflugs Frühhafer and Primus (Svalöf) contracted only a little smut.

CHEREWICK (W. J.) & POPP (W.). **A modification of Moore's method of inoculating Wheat and Barley with loose smut.**—*Phytopathology*, 40, 11, pp. 1054–1056, 1 fig., 1950.

In tests of various methods of inoculating wheat and barley with loose smut [*Ustilago tritici* and *U. nuda*: *R.A.M.*, 30, pp. 101, 151] at the Dominion Laboratory of Plant Pathology, Winnipeg, Moore's method [ibid., 15, p. 567; 26, p. 101] with a slight modification was found to be the quickest and most effective. The introduction of a valve from a small atomizer into the pump secured a higher vacuum. A $\frac{1}{4}$-in. copper 'T' pipe was inserted into the suction tube just above the inoculation chamber, its free end being fitted with a piece of rubber tube, clamped with a pinch cock. With the pinch cock closed, a stroke of the pump caused the glass cylinder to become filled with the spore suspension. After the enclosed cereal spike, which was held with a very soft rubber stopper, was covered with the suspension, the rubber tube was pinched and a few strokes of the pump exhausted the air from the florets and replaced it with the spore suspension. The pinch cock was then opened and the rush of air drove still more spores into the florets. With two persons working together 100 heads per hour were inoculated and over 90 per cent. infection resulted in susceptible barley varieties.

If soft rubber stoppers are unobtainable, a larger Dewar glass cylinder (5 cm. in diameter) fitted with an ordinary rubber stopper may be used. In the latter is cut a rectangular hole into which a piece of sponge rubber 2 mm. larger is forced and fixed with adhesive. The whole is then split through. The stalks of the heads are held by the sponge rubber, and five to ten of barley, or 10 to 15 of wheat can be inserted together. Two persons can inoculate 400 to 600 heads per hour.

Hanson (E. W.), Ausemus (E. R.), & Stakman (E. C.). **Varietal resistance of spring Wheats to Fusarial head blight.**—*Phytopathology*, 40, 10, pp. 902–914, 1950.

During the past 20 years hundreds of wheat varieties and thousands of hybrids and selections have been tested at the Minnesota Agricultural Experiment Station [*R.A.M.*, 9, p. 171] for their reaction to head blight (*Gibberella zeae* and *Fusarium* spp.) in shaded and non-shaded field plots, under both natural and artificially induced epiphytotic conditions. All contracted the disease to a greater or lesser extent, only a few being comparatively resistant, e.g., Progress, Haynes Bluestem, Cadet, and Rival. All the durums tested were at least moderately susceptible [cf. ibid., 7, p. 570; 25, p. 299]. Relative differences in resistance to blight are readily determinable by growing the plants under epiphytotic conditions. High humidity being essential to blight development [ibid., 28, p. 58], it is usually advisable to spray the stands at heading time with a spore suspension of the pathogen to ensure adequate infection, and shade in dry seasons. In Minnesota early varieties tend to become more heavily infected than late ones, moisture and temperature conditions during the critical period from flowering to the medium-dough stage being apparently the factors determining the amount of blight. In these studies the percentage of head infection on the most susceptible varieties ranged from 70 to 100 per cent. on the shaded plots and from 0 (in dry seasons) to 95 per cent. on open field plots where the humidity was not regulated. The average infection rating on the resistant Haynes Bluestem during the period from 1933 to 1943 (excluding the dry seasons of 1938 and 1940) on shaded plots was 25 per cent. In 1938, however, by furnishing ideal conditions for the pathogen, it was possible to secure a rating of 95 per cent. for this variety.

In preliminary studies started in 1939 on the nature of inheritance of varietal reaction to blight certain F_2 progenies appeared to have lower average infection percentages than others, while in some of the hybrids the percentages of plants in the resistant classes equalled or surpassed those of either parent. In the F_3 of a cross between H44-Thatcher and Haynes Bluestem some of the hybrids were as resistant as the resistant parent.

Sprague (R.) & Rainey (C. J.). **Studies on the life history of Typhula spp. on winter Wheat in Washington.**—Abs. in *Phytopathology*, 40, 10, p. 969, 1950.

The sclerotia of *Typhula idahoensis* and *T. itoana* [*R.A.M.*, 30, p. 124] are found only on the stubble of the previous season's crop of winter wheat in Washington [ibid., 29, p. 255]. They germinate during moist weather in October, first expanding and becoming more globular and then turning brown and faintly translucent. In early November pointed probasidiophores emerge from the sclerotia and spores were discharged during rainy or foggy weather from 14th November to 21st December, 1949, many having been collected on spore traps to a height of 3 ft. above soil level in the stubble field. In planted fields they were seldom detected more than a few rods away from their place of origin in the stubble. Mycelium carried in the soil would appear to be more important as a source of snow mould than that arising from spores. Early (November) snow falling on wet, unfrozen ground (as in 1948–9) is conducive to infection, which is negligible when the snow is late (December) and falls on frozen ground (as in 1949–50).

Reinmuth (E.) & Hopf (M.). **Vorratsbeizung von Roggen, Gerste und Hafer bei verschiedenem Wassergehalt des Kornes.** [Storage seed treatment for Rye, Barley, and Oats at various water contents of the grain.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 3, 7–8, pp. 148–150, 1 graph, 1949. [Received June, 1950.]

Experiments were carried out in 1949 at the Institute for Phytopathology and Plant Protection, Rostock University, Germany, to determine the storage properties of rye, barley, and oat grain treated with abavit, ceresan, and germisan, and to study their effects on germination and the effect of various humidity contents of the grain on storage life.

The winter rye variety Petkuser, severely infected with *Fusarium* and [unspecified] moulds, and an unnamed winter barley were used. The original moisture content of the grain was 15·6 and 15·8 per cent.; that of other samples was increased by 2·5 or 5 per cent. beyond this level by adding water. After allowing four days for the grain to become uniformly moist it was shaken in closed bottles with the fungicides and stored at room temperature. After four weeks the treated rye samples with high moisture contents (20·6 per cent.) were heavily infected, though much less than the untreated, while those with lower humidity were only mildly infected. Infestation increased in all samples during further storage, but was most severe in samples with high moisture contents; barley and oat grain, on the other hand, remained comparatively free from infection and at the end of eight weeks the moisture content had fallen. Germination of the various rye samples varied greatly, those with the highest moisture having the lowest rates. Seed treated with ceresan had the highest germination percentages. After eight weeks' storage all treated seed germinated better than the untreated.

It is concluded that seed not entirely free from infection should be treated as early as possible before storage, particularly that with a high moisture content.

Bremer (H.) & Özkan (M.). **Darı rastığı ve mücadelesi.** [Millet smut and its control.]—*Zir. Derg.*, 11, 101, pp. 21–26, 2 figs., 1950. [Turkish, with English summary.]

In experiments carried out at Ankara from 1944 to 1949 dry seed treatment of sorghum and millet (*Panicum miliaceum*) with agrosan G and lunasan (200 gm. per 100 kg. seed) gave stands virtually free from *Sphacelotheca sorghi* and *S. panici-miliacei* [*S. destruens*: *R.A.M.*, 27, p. 115; 29, p. 174], respectively.

Ishizaki (H.). **Effect of old cultures of Ophiobolus heterostrophus on the germination of seeds.**—*Igaku to Seibutsugaku* (*Med. & Biol.*), 16, pp. 215–218, 1950. [Abs. in *Chem. Abstr.*, 45, 3, p. 1208, 1951.]

In experiments at Kyoto University, Japan, the germination of Shonan maize seed after three days at 28° C. was reduced from 98·8 to 51·5 per cent. by treatment with conidia from cultures (fresh or old) of *Ophiobolus* [*Cochliobolus*] *heterostrophus* [see above, p. 226]. The activities of the respiratory enzymes, catalase, peroxidase, and dehydrogenase were markedly lower in the treated than in the untreated seeds. Presumably, therefore, the reduction of seed germination by cultures of *C. heterostrophus* was mainly due to the inhibition of respiration.

Fernandez Valiela (M. V.). **Informe preliminar acerca de la etiología de la 'podredumbre de los raicillas' del Naranjo agrio injertado.** [Preliminary report on the etiology of the 'root rot' of the grafted Sour Orange.]—*Rev. Invest. agríc., B. Aires*, 2, 3, pp. 139–146, 2 pl., 1948. [Received January, 1951.]

It appears from the results of preliminary tests at the Delta Experiment Station, Argentina, that the 'tristeza' form of sour orange root rot [*R.A.M.*, 30, p. 154]

is transmissible from diseased plants by budding and by the locally prevalent black aphid *Paratoxoptera argentinensis*. Thus, out of 16 seedlings of the Ombligo variety inoculated by grafting on 18th April, 1948, 12 developed root rot, the corresponding figures for three other tests involving 13, 4, and 10 China trees being 12, 3, and 7, respectively. In another budding test on double (sweet and sour) stocks, the roots of 14 out of 20 China trees inoculated on 3rd January, 1948, decayed, the corresponding figures for 5 China and 15 Ombligo (12th December, 1947), being 4 and 10, respectively. The sweet orange stock remained entirely unaffected. *P. argentinensis* (50 per plant) transmitted the disease.

It is concluded from these observations that the 'tristeza' root rot is an infectious disease caused by a virus [see next page] and highly pathogenic to the young (under one-year-old) greenhouse plants used in the experiments. The incubation period ranges from 70 to 90 days.

Loest (F. C.). **Orchard practices in relation to 'collar rot' of Citrus.**—*Fmg S. Afr.*, 25, 295, pp. 331–333, 340, 5 figs., 1950.

Bark decay at the base of citrus trees, sometimes referred to as 'collar rot' in South Africa, may be an advanced stage of dry root rot or of *Diplodia* gummosis, both caused by *D. natalensis* [*R.A.M.*, 21, p. 486; 22, p. 19; 27, p. 351], or of brown rot gummosis (*Phytophthora citrophthora*) [loc. cit.]. Dry root rot occurs in all citrus-growing areas in South Africa, but is important mainly in the Transvaal; *Diplodia* gummosis is important only in the Transvaal; and *P. citrophthora* only in Natal and eastern Cape Province. Though *P. citrophthora* is present in the soil in all the local citrus-growing areas, the only record for the Transvaal is on five Triumph grapefruit trees subjected to a three-weekly irrigation for three-and-a-half years and a weekly irrigation for a further two. Direct inoculation of the trunks of Triumph grapefruit in the Transvaal resulted in severe attack of brown rot gummosis followed by death. The rarity of the disease in this Province may be due to the very low winter and early spring rainfall compared with wet, cool soil conditions in the same periods in Natal and eastern Cape Province.

The evidence shows that it is unnecessary to keep irrigation water away from the trunks of citrus trees in the Transvaal, but the soil surface in the basin round trees up to one year of age in any part of the Union should slope towards the trunk. The practice of heaping up the soil round the trunk favours the disease where it is present and in all areas may cause insufficient irrigation of newly planted trees. The basined area should be increased on either side in the line of the row when the trees are about two years old. In localities where brown rot gummosis may develop, the existing circular basin is destroyed by ridging the soil in straight parallel lines one on either side of the trunk at right-angles to the tree row. The 2 ft. strip between the ridges should be level and be neither irrigated nor fertilized.

In advanced stages of dry root rot the trees should be sprayed with urea alone or with lime plus (if necessary) zinc, manganese, and magnesium. Root and trunk surgery is recommended in eastern Cape Province and Natal, where both dry root rot and brown rot gummosis are often present on the same tree.

McClean (A. P. D.). **Virus infections of Citrus in South Africa. III. Stem-pitting disease of Grape Fruit.**—*Fmg S. Afr.*, 25, 294, pp. 289–296, 11 figs., 1950.

The author describes the occurrence and symptoms of stem pitting disease of grapefruit in South Africa [*R.A.M.*, 29, p. 411; 30, pp. 35, 153, and next abstract]. Hosts not previously recorded include rough lemon seedlings and (by transmission) Tahiti lime and kumquat [*Fortunella japonica*]. When trees are reared from infected buds on healthy rough lemon seedling stocks infection invades the stock. Further evidence of the widespread nature of the disease was the finding of infected

citrons, West Indian limes, sweet limes, shaddocks, a lemon variety used as a rootstock, and more than 20 varieties of sweet orange, including Pine, Bailedge Early, Malta egg, Pera, Valencia seedless, and Early Maturing Navel in the orchards of the Subtropical Horticultural Station at Nelspruit.

Rough lemon and most varieties of sweet orange grown on either rough lemon or sweet orange stock are highly tolerant. These species are also tolerant when grapefruit is used as a scion. The three factors contributing to the wide spread of the virus are the susceptibility of most forms of citrus, the prevalence of *Aphis citricidus*, and the use of vegetative propagation.

In the severe form of the disease plants stop growing immediately, the top-most leaves remain small, turn yellow, and may develop corky eruptions along the veins on the upper surface. Mildly infected plants continue growth, but less vigorously and with lateral shoot production. New leaves are fairly normal in appearance. The veinal fleckings and wood-pitting are symptoms common to the two forms of the disease whose relationship is not yet certain. The severe virus has been recovered from all sweet orange trees tested, including normal looking Valencia and Washington Navel on rough lemon or sweet orange stocks, and unhealthy, dwarfed Valencia on sweet lime; also from one Sampson tangelo and a Natal tight skin naartjie (tangerine). The mild strain was recovered from West Indian lime, Tahiti lime, and Lisbon lemon on sweet orange and on sweet lime. Both strains were recovered from a Bailedge Early orange.

When either the tops or buds of Valencia orange were grafted on to sour orange seedlings and infected by the vector *A. citricidus*, a general suppression of growth resulted and the leaves of the scion turned yellow and stood upright. The identity of the stem pitting virus with the one affecting Seville orange rootstocks in South Africa are discussed with reference to tristeza in Brazil [see next abstract]. The author does not consider the virus to be related to psorosis or scaly bark [ibid., 29, p. 23; 30, p. 153]. The disease so far has had no adverse effects on the sweet orange industry in South Africa, but the potential danger is very great, as illustrated by grapefruit.

A note is given on the 'greening' disease [cf. ibid., 17, p. 239] possibly associated with virus infection, which is present in the eastern Transvaal and was observed on Pera orange at Nelspruit. Premature decline of tangerine is common in eastern Transvaal whether on its own rootstock or on various strains of rough lemon and sweet orange. Die-back of the branches is more severe than in grapefruit and the fruit may be lop-sided as in 'greening' disease. Mandarins appear to be more tolerant. At Nelspruit a parent tree of Tahiti (Persian) lime on *Poncirus trifoliata* stock, planted in 1931, is in an advanced stage of decline and all its progeny budded on various rootstocks are dead, while all the citrons on various rootstocks are unthrifty.

In a section on rootstock influence, sour orange, sweet orange, *P. trifoliata*, and sweet rough lemon are all stated to be unsatisfactory. Dwarfed trees of Washington Navel orange and grapefruit on *trifoliata* roots often show scaling of the bark [cf. ibid., 29, p. 506]. Sour orange is by itself apparently uninjured by the virus. The behaviour of trees on *trifoliata* depends on the scion variety.

Costa (A. S.), Grant (T. J.), & Moreira (S.). **A possible relationship between tristeza and the stem-pitting disease of Grapefruit in Africa.**—*Calif. Citrogr.*, 35, 12, pp. 504, 526–528, 2 figs., 1950.

In extensive tests of citrus stocks and scions in relation to tristeza disease carried out at Campinas, Brazil [cf. *R.A.M.*, 28, p. 522; 29, p. 300], grapefruit varieties used as rootstocks were found to vary in their sensitivity to the disease, Marsh, Red Mexican, and Thompson being as sensitive as sour orange, while Duncan and Leonardy were affected more slowly. When budded on to sour orange

or other non-tolerant varieties they developed typical tristeza symptoms [see above, p. 269], though scions on sour orange declined more slowly than sweet orange on the same stock. Infected unbudded Leonardy, Foster, Duncan, Marsh, Red Mexican, Royal, Thompson, Ruby Red, and Red Blush grapefruit seedlings developed similar symptoms. Grapefruit scions may exhibit a certain degree of injury even on tolerant stocks, but the symptoms are much milder.

At Campinas symptoms of tristeza, including stem pitting [ibid., 30, p. 99 and preceding abstract], have been observed on branches of Duncan grapefruit on Rangpur lime, *Poncirus trifoliata*, mandarins, and sweet oranges. In an orchard at the Citrus Experiment Station, Limeira, Brazil, where tristeza is common, stem pitting occurred in the following grapefruit varieties on tristeza-tolerant stocks: Royal, Viçosa, Aranyan, Red Blush, Retiro, Foster (severe), Duncan, and Marsh (slight). The degree of pitting varied in the different varieties, and even branches of the same plant showed considerable variations. The reactions of lime are very similar. They are non-tolerant as rootstocks; scions on non-tolerant stocks develop typical tristeza symptoms; and seedlings show symptoms when infected. Beledy, Kirk, Key (Mexican), Kady, Mul, and 'Lima de Umbigo' were sensitive. The growth developing from buds harbouring the virus may also exhibit symptoms on tolerant stocks. The range of varietal reactions, however, appeared to be wider than in grapefruit. Persian lime and Rangpur lime are much more tolerant rootstocks than other varieties. Stem pitting symptoms were observed in plants which had been infected for some time, and were more pronounced in those that made some growth than in stunted ones.

The pitting symptoms of grapefruit and lime in Brazil are similar to those described in Africa and both diseases are transmitted by *Aphis citricidus* [loc. cit.]. It is probable that the stem pitting disease in Africa is caused by the tristeza virus complex.

Trumble (H. P. C.). **Zinc sprays for Citrus mottle leaf control—zinc oxide not now recommended.**—*J. Dep. Agric. S. Aust.*, 54, 5, pp. 236–237, 1950.

Since the chalking type of zinc oxide applied to citrus trees suffering from mottle leaf [*R.A.M.*, 28, p. 571] has caused widespread and severe leaf drop [cf. ibid., 25, p. 341], a mixture consisting of 5 lb. commercial zinc sulphate and 2½ lb. limil (lime) to 100 gals. water is recommended for maintenance spraying, double quantities of zinc sulphate and lime being used if the trees have not been sprayed before.

Jacques-Félix (H.). **Première action contre la trachéomycose du Caféier en Côte d'Ivoire.** [Preliminary action against tracheomycosis of Coffee trees in the Ivory Coast.]—12 pp., 6 figs., Nogent-sur-Marne, Station technique d'Agriculture tropicale, 1950.

For many years a tracheomycosis has been threatening the coffee plantations of the Ivory Coast [see above, p. 227] and now affects large areas of trees, particularly in the Daloa territory. It is believed to exist endemically at various foci, occasionally breaking out into destructive epidemics when conditions permit. Affected trees may appear quite normal until a few weeks before maturity, when the leaves are shed, the berries wither, and the tree dies. At the appearance of the primary symptoms the bark is dry and adheres abnormally to the wood. Both the bark and the underlying wood are necrotic, the bark brown and the wood greyish. Underneath the necrotic area a streak extends from the stock up into the trunk, indicating that the disease originates at the collar or in the roots, gaining entry through wounds. Numerous perithecia were visible in the cracks in the bark. The vessels were obstructed by the mycelium of a *Fusarium* sp. probably identical with the organism similarly affecting *Coffea excelsa* and *C. robusta* in the Belgian Congo [loc. cit.].

Of the Kouilou, Indénié, and Robusta lines, Kouilou is the most susceptible and Robusta, in the Ivory Coast at least, practically resistant. Infected trees should be felled and burnt before the spores are released. If left too late they should be destroyed by spraying an inflammable liquid on to the trunk. However, the best method of all would be to flame the trunk first to kill the spores. Reduction of the number of wounded, susceptible trees is also recommended.

Moskovetz (S. N.). Об устойчивости Хлопчатника к болезням. [On the resistance of Cotton to diseases.]—Агробиология [*Agrobiology*], *1950*, 3, pp. 148–151, 1950.

Investigations were made over a period of years at the Azerbaidzhan Scientific Research Institute of Agriculture, Kirovabad, into the resistance to diseases of various cotton varieties grown in different areas, and also recently into the resistance of the same cotton varieties grown under different conditions. The most serious cotton diseases in Azerbaidzhan are gummosis [blackarm] (*Bacterium* [*Xanthomonas*] *malvacearum*) [*R.A.M.*, 27, p. 475] and *Verticillium* wilt (*V. dahliae*) [loc. cit.]. In the 1947 tests the percentages of infection by *X. malvacearum* (in May) for S–3173 from Uzbekistan was 39·8 and by *V. dahliae* (in August) 39·5; for the same variety from Azerbaidzhan the percentages were 51·6 and 28·2, respectively. The respective percentages for 1306–DV from Uzbekistan were 15·3 and 49·8, and from Azerbaidzhan 38·6 and 44·9; and for 108–F 10 and 40·2 and 19·4 and 22·4, respectively. In 1948 blackarm percentages for S–3173 from Uzbekistan were 45·2 and wilt 11·1; the corresponding figures for Azerbaidzhan seed being 75·5 and 5·3 in the first year and 78 and 7·6 in the second; for Uzbekistan seed of 1306–DV 65·4 and 21·8; the same from Azerbaidzhan 69·1 and 16·6 in the first year and 79·6 and 8·2 in the second; for 108–F from Uzbekistan 25 and 11·2, and from Azerbaidzhan 44·2 and 11 in the first year and 45·3 and 10 in the second.

The results demonstrate that disease resistance in cotton plants is not constant; it can be increased by providing suitable conditions for plant growth. They also confirm the hypothesis that the economic and biological properties of seeds greatly depend on the conditions of growth during preceding generations. An accurate evaluation of disease resistance of cotton varieties can be made only when the plants are grown from seed produced under the same ecologico-geographical conditions.

Fisher (Fran[cine] E.) & Griffiths (J. T.). **The fungicidal effect of sulfur on entomogenous fungi attacking Purple Scale.**—*J. econ. Ent.*, 43, 5, pp. 712–718, 7 graphs, 1950.

In tests in 1948 and 1949 at the Citrus Experiment Station, Lake Alfred, Florida, wettable sulphur (9·2 lb. per 100 gals.), lime-sulphur (7·25 lb.), and a sulphur paste (9·1) were fungicidal to the entomogenous fungi *Myiophagus* sp. and *Hirsutella besseyi* [*R.A.M.*, 29, p. 562] on Pineapple orange trees. The sulphur paste was the most and the wettable sulphur the least injurious to the fungi; conversely, purple scale (*Lepidosaphes beckii*) infestations were most severe on the trees sprayed with sulphur paste, followed in descending order by lime-sulphur, wettable sulphur, lime, and the untreated. From the standpoint of obtaining as much natural control as possible of purple scale by the use of entomogenous fungi, wettable sulphur would appear to be preferable for the control of rust mites (*Phyllocoptruta oleivora*) than lime-sulphur or sulphur paste.

Tochinai (Y.) & Takee (G.). **Studies on the physiologic specialization in Fusarium lini Bolley.**—*J. Fac. Agric. Hokkaido Univ.*, 47, 3, pp. 193–266, 2 pl., 1950.

In studies carried out at Hokkaido University, Japan, 41 strains of *Fusarium lini* [*R.A.M.*, 14, p. 634; 29, p. 260] were obtained by single-spore isolation from

wilted flax plants collected in the vicinity, and were arranged in ten different cultural groups. Inoculations were made to three flax varieties, Pernau no. 1, Saginau no. 1, and the resistant Taikinama, by inoculating sterilized pot-soil with a spore suspension. Most of the strains in cultural group II and the two strains in groups VIII and IX were strongly or moderately virulent, though the strains in groups V, VI, and VII showed scarcely any pathogenicity, causing only an occasional yellowing of two or three leaves. The strains in group I showed very little pigmentation and zonation. Most of those in group II and those in III, IV, VIII, and one of group IX developed pale purplish-vinaceous colours at 32° C. and pale congo pink to congo pink colours at 28°, 25°, and 20°, with conspicuous zonation at 32° and 20°, but not at 28° and 25°. The two strains in group X developed no zonation at 20° and a pale purplish-vinaceous pigmentation at 28°. The remaining strains produced a shell pink colour at 32°, 28°, and 25°, and pale congo pink at 20°; there was no zonation. All strains grew best on a mineral-sucrose agar medium containing 0·5 per cent. ammonium nitrate. Aversion phenomena [ibid., 3, p. 471] occurred among different strains when grown together. On potato glucose agar single-celled microconidia were produced most abundantly, and marked differences were noted in the lengths of the macro- and microconidia as between the different strains. Strains which produced triseptate macroconidia fell into two groups, one with the mode of spore length ranging from 35 to 40 μ and the other from 25 to 30 μ. As regards the length of the microconidia the strains fell into three groups, with modes of 10, 7·5, and 5 μ, respectively. Sectoring occurred in some strains.

As a result of these data the 41 strains were classified in ten different physiologic forms according to cultural and biometrical differences and pathogenicity to the three flax varieties inoculated. In physiologic form II aerial growth was prominent and floccose to cottony, pigmentation conspicuous, the mode of length of the macroconidia was 30 μ and of the microconidia 7·5 μ, and pathogenicity was violent or strong to Pernau no. 1. It comprised 15 strains all of which were classed in cultural group II. Physiologic form IV was distinguished from form II by the fact that pathogenicity was very weak to Saginau no. 1, whereas in form II it was strong or medium. It comprised two strains, the remaining two of cultural group II. Physiologic form VII (one strain) differed from form II in the slower colony development, the velvety aerial growth on apricot-juice agar, the light purplish-vinaceous pigmentation tinged in places with livid brown on steamed rice, and in the high mode of microconidial length (10 μ). Pathogenicity was strong to Pernau no. 1 and moderate to Saginau no. 1 and Taikinama. The pathogenicity of the remaining physiologic forms was moderate, weak, or nil.

Baker (K. F.), Dimock (A. W.), & Davis (Lily H.). **Ramularia cyclaminicola Trel., the cause of Cyclamen stunt disease.**—*Phytopathology*, 40, 11, pp. 1027–1034, 2 figs., 1950.

Studies at the University of California and Cornell University, New York, demonstrated the identity of three diseases of *Cyclamen*, *Ramularia* leaf disease (*R. cyclaminicola*) described by W. Trelease (Two leaf-fungi of cyclamen.—*Trans. Ill. Acad. Sci.*, 9, pp. 143–146, 1916), stunt (*Cladosporium cyclaminis*) [*R.A.M.*, 22, p. 10], and a previously undescribed wilt observed at Los Angeles, California, in 1946. Isolations from plants with stunt and wilt symptoms yielded identical species of *Ramularia* and all three disorders appear to be phases of the same disease, the agent of which is *R. cyclaminicola*. It appears that the disease complex is confined to North America. The *Ramularia* phase has been collected in Illinois, Minnesota, Ohio, California, and Massachusetts. Stunt, in addition to the States previously reported [ibid., 11, p. 460], has been recorded in Quebec, Colorado, and Massachusetts. It commonly causes moderate losses, but sometimes affects the entire crop.

In inoculation tests with isolates from diseased corms or from spores produced on wilted leaves six plants out of nine inoculated at the corm apex or on uninjured leaves developed stunt or wilt symptoms in 137 to 233 days. The fungus was recovered from vascular tissue in the corms, and in some cases from the roots. A comparison of Trelease's type specimen and the fungus causing leaf disease in California showed them to be the same; *C. cyclaminis* becomes a synonym.

Because of the possible importance of air-borne conidia in spreading the disease, seedlings should not be grown near old infected plants. Spraying seedlings with a fungicide is also advised.

Koch (L. W.). **A bacterial soft rot of Gladiolus.**—*Sci. Agric.*, 30, 11, pp. 483–487, 2 pl., 1950.

During the summer of 1949, gladiolus plants near Harrow, Ontario, became affected by a destructive soft rot; the disease was found in many other fields within a distance of 50 miles, and also at Oakville, some 200 miles away. Infection was most prevalent and severe on plants from which the upper part of the flower stalks had been removed, chocolate-brown areas developing on these, usually starting at the cut end and spreading downwards. In some cases, all the leaves round an infected stalk turned yellow and died. Plants in which infection was confined to the remnant of the flower stalk and the immediately adjacent leaf sheath showed chlorosis and stunting. Almost invariably the pith of the brown flower stalk disappeared, with collapse and necrosis of the contiguous tissues. The basal parts of the inner leaves were usually brown and necrotic. The outer leaves often appeared water-soaked, with deposits of a reddish gel-like exudate between the bases on the upper part of the corms. Oval to elongated lesions with a reddish-brown halo were found on leaves adjacent to the necrotic portions. Finally, the leaves became recumbent, dry, and chocolate-brown.

From infected material a bacterium closely resembling *Erwinia carotovora* [*R.A.M.*, 7, p. 229; 16, p. 181] was isolated. Re-isolations from inoculated plants in every instance gave bacteria in all respects similar to those obtained from natural infections.

Braun (A. C.). **A tumor-inducing bacterium isolated from Euonymus galls.**—*Phytopathology*, 40, 11, pp. 1058–1060, 1950.

Large tumorous outgrowths on a hedge of *Euonymus fortunei* [var.] *radicans* yielded consistently, in isolations at the Rockefeller Institute for Medical Research, New York, a bacterium which induced typical crown gall tumours in tomato, sunflower, *Kalanchoe*, and sugar beet plants. The isolates differed from typical strains of *Agrobacterium* [*Bacterium*] *tumefaciens* [*R.A.M.*, 29, p. 607] in growing poorly and without a pellicle on Difco nutrient dextrose broth and not at all in a mineral salts medium containing dextrose as the carbon source. The morphological, tinctorial, and pathogenic properties were, however, identical and it appeared that the isolated organism was a biochemically deficient mutant of *Bact. tumefaciens*. As the addition of calcium pantothenate, nicotinic acid, and biotin to the basic medium resulted in excellent growth of the *Euonymus* bacterium, it may alternatively be regarded as a strain of *Bact. tumefaciens* that has lost its ability to synthesize three vitamins essential for optimum growth.

Morris (H. D.) & Pierre (W. H.). **Minimum concentrations of manganese necessary for injury to various legumes in culture solution.**—*Agron. J.*, 41, 3, pp. 107–112, 4 figs., 1949.

The results of investigations at the Iowa Agricultural Experiment Station to determine the minimum concentrations of manganese necessary for injury [*R.A.M.*, 27, p. 336] to Korean *Lespedeza*, Richland soy-bean, Clay cowpea, G.F.A. Spanish

groundnut, and Madrid yellow sweet clover [*Melilotus officinalis*] plants in culture solution may be summarized as follows. Concentrations as low as 1 to 10 p.p.m. proved toxic to all five species, the relative sensitivity of which to soluble manganese was in the following descending order: *Lespedeza*, sweet clover, soy-bean and cowpea, and groundnut. *Lespedeza* and cowpeas absorbed most manganese and groundnuts and sweet clover least. The concentrations of manganese were much higher in the leaves than in the stems.

Kreitlow (K. W.), Garber (R. J.), & Robinson (R. R.). **Investigations on seed treatment of Alfalfa, Red Clover, and Sudan Grass for control of damping-off.** —*Phytopathology*, 40, 10, pp. 883–898, 1950.

In experiments carried out at the U.S. Regional Pasture Research Laboratory, State College, Pennsylvania, to determine the efficacy of seed treatment in the control of damping-off of forage crops [*R.A.M.*, 20, p. 211; 22, p. 484] a virulent isolate of *Pythium debaryanum* from lucerne was used. Preliminary tests revealed no material difference in infectivity whether seeds were sown in freshly infested soil or the same incubated several days earlier. Density of stand also did not affect pre-emergence damping-off, but the incidence of post-emergence symptoms was higher where the plants were crowded.

Germination of lucerne and red clover seed was not impaired by treatment with new improved ceresan, spergon, arasan, semesan, or yellow cuprocide, but that of Sudan grass was decreased by the first-named in excess and its viability destroyed when treated seed was stored for six months. All the fungicides increased the stands in soil infested by *P. debaryanum*, new improved ceresan giving the greatest increase of lucerne and red clover, and spergon, semesan, and arasan of Sudan grass. Only Sudan grass responded favourably to mineral fertilizers, the average stands in infested sand ranging from 39·7 to 45 per cent. as compared with 23 in the non-fertilized. More damping-off occurred with increasing soil mositure, but fungicidal treatment reduced its incidence even in saturated soils. For instance, in low moisture (15 per cent.), moderate (25 per cent.), and saturated infested soils the percentage stands of treated Sudan grass were as follows: spergon 58·9, 75·4, and 50, respectively; semesan 58·4, 73·5, and 48·3; arasan 65·8, 81·1, and 59·3; new improved ceresan 44·3, 53·9, and 34·2; and yellow cuprocide 52·8, 77·8, and 59·5, while those of the non-treated were 45·5, 37·1, and 14·5. The figures for lucerne stands at the same three moisture levels were: spergon 18, 14·8, and 9·6, respectively; semesan 19·6, 14·2, and 11·6; arasan 22·7, 22·3, and 13·8; new improved ceresan 30·5, 35·5, and 23·3; and yellow cuprocide 21·3, 6·9, and 4·4, as compared with 16·4, 3·1, and 2·2 in the controls. The pathogen retained its virulence for 58 days in moist soil but rapidly lost it under dry conditions. Virulence and longevity were not impaired at different pH levels from 5·5 to 8·2. Treated lucerne and red and Ladino clover seeds stored for 30 months at 25° C. in open or closed containers showed no apparent injury from any of the fungicides. In extensive field trials over a three-year period in Pennsylvania, Rhode Island, and New Jersey, Sudan grass in normal soil gave the largest and most consistent increases in stand from treated seed. In different places the response to treatment of lucerne and red clover varied from reductions to marked increases (in Pennsylvania). In general, red clover benefited more from the treatments than lucerne.

Ekstrand (H.). **Skador på de övervintrande grödorna vintern 1949–50.** [Damage to the overwintering crops in the winter of 1949–50.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1950*, 4, pp. 57–62, 1950.

The heavy rainfall in Sweden in the autumn of 1949 contributed to severe infection of winter wheat, rye, and barley [cf. *R.A.M.*, 30, p. 44] by *Fusarium nivale* [*Calonectria nivalis*]. As usual, the Finnish rye varieties, Oiva, Toivo, and

Pakka, together with the Norrbotten 'land' rye and in some experiments Björn, proved the most resistant of those tested. Among the wheats Lant (Sammet), Virtus, and especially the Finnish Olympia were more resistant than any of the others. Differences in varietal reaction to *C. nivalis* were also observed among forage grasses, e.g., the Valinge strains of English rye grass [*Lolium perenne*] and the Bottnia [ibid., 30, p. 45] of meadow fescue [*Festuca pratensis*] were marked by a high degree of resistance.

Typhula itoana and *T. borealis* [ibid., 26, p. 9; 28, pp. 9, 279] were commonly found in association with *C. nivalis* on cereals, but caused little damage. *T. borealis*, however, was responsible for heavy reductions in some of the grass stands. It was noted in connexion with fertilizer experiments that phosphorus deficiency favours infection, e.g., of timothy [*Phleum pratense*], by this pathogen.

Clover rot [*Sclerotinia trifoliorum*: loc. cit.] caused appreciable losses only on the Småland upland, where the crop at the Flahult Experiment Station, for instance, was largely destroyed. In another locality where severe depredations from this source have been experienced of recent years, 30 to 40 per cent. of the clover stands in first-year pastures failed in consequence of the disease.

Mühle (E.). **Möglichkeiten des Pflanzenschutzes im Grassamenbau.** [Possibilities of plant protection for grass seed growing.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 3, 7–8, pp. 150–152, 1949. [Received June, 1950.]

The greatest damage to seed and forage grasses in Germany is caused by rusts, those of particular importance being *Puccinia poae-sudeticae* [*R.A.M.*, 26, p. 493] and *P. poarum* [ibid., 22, p. 484] on *Poa pratensis*, and *Puccinia phlei-pratensis* [loc. cit.] and several races of *P. coronata* [ibid., 23, p. 258] on *Phleum pratense*; also mildew [*Erysiphe graminis*: ibid., 16, p. 519] and leaf spot (*Helminthosporium vagans*) [ibid., 20, p. 22]. The last-named has spread considerably during recent years on *Poa pratensis*; as it is often transmitted by seed, treatment is advised. The breeding of varieties resistant to all the pathogens is recommended as the best means of control.

Taylor (C. R.). **Potash deficiency in land in Rotorua district.**—*N.Z.J. Agric.*, 81, 1, pp. 21–22, 3 figs., 1950.

Recent tests in the Rotorua district have shown that although the pumice soils of the North Island, New Zealand, were once rich in potassium, there is now a deficiency in many localities which have been longest under cultivation. Those chiefly affected are Oturoa and Kaharoa and parts of Ngongotaha, Mamaku, Reporoa, and Broadlands, where pasture crops have deteriorated. Initial applications of potash at 1 cwt. per acre have produced excellent responses in pasture and lucerne in a few weeks.

Whitehead (M. D.) & Holt (E. C.). **Cercospora leaf spot of tall Fescue and smooth Brome.**—*Phytopathology*, 40, 11, pp. 1023–1026, 2 figs., 1950.

From April to October, 1949, *Festuca elatior* and *Bromus inermis* in grass nurseries at College Station and Temple, Texas, were severely affected by a leaf spot caused by *Cercospora festucae* [*R.A.M.*, 29, p. 175]. At College Station approximately 10 per cent. of one-year-old seedlings of the Kentucky 31 strain of tall fescue and 30 per cent. of the Alta strain [ibid., 30, p. 111] were dead by November. In a spaced planting of mature Alta 100 per cent. of the clones were severely infected and 36 per cent. were either dead or had fewer than 10 living tillers. About 50 per cent. of the mature smooth brome plantings were heavily infected and the yields markedly reduced, but no clones were killed.

An amended description of the fungus is presented.

B[OSCH] (E.). **La chlorose.** [Chlorosis.]—*Rev. romande Agric., Vitic., Arboric.*, 6, 10, pp. 75–76, 1950.

The various factors responsible for chlorosis in plants are discussed with particular reference to iron, manganese, and magnesium deficiencies in fruit trees [*R.A.M.*, 29, pp. 262, 312, 624], their symptoms, and control in western Switzerland.

WOODBRIDGE (C. G.). **A note on the incidence of zinc deficiency in the Okanagan Valley of British Columbia.**—*Sci. Agric.*, 31, 1, p. 40, 1 pl., 1951.

Zinc deficiency of fruit trees is reported for the first time, it is believed, from Canada, some of the interior fruit-growing areas of British Columbia being affected. Only apple trees have shown the condition so far [cf. *R.A.M.*, 29, pp. 31, 159, 569], and though very often only one or two limbs in an orchard show the disorder, in some instances small areas are severely affected and all the trees in them present one or more of the characteristic symptoms. Die-back, under the conditions prevailing in the Okanagan Valley, appears to be caused by low winter temperatures which kill weakened tissues. Rosette and little leaf have been controlled locally by zinc sulphate sprays (20 lb. per 100 gals. water) during the dormant period, response being obtained during the following season in some plots, but in others spraying for three successive years was necessary to effect amelioration. The zinc content of affected leaves varied from 3 to 22 p.p.m. on a dry weight basis, as against 6 to 40 for healthy leaves.

FLORENZANO (G.). **Biologia di Endostigme pirina (Aderh.) Syd. (= Venturia pirina Aderh.) e di E. cinerascens (Fleisch.) Jörst. (= V. inaequalis (Cooke) Aderh.) ed epidemiologia della ticchiolatura in Italia.** [The biology of *Endostigme pirina* (Aderh.) Syd. (= *Venturia pirina* Aderh.) and *E. cinerascens* (Fleisch.) Jörst. (= *V. inaequalis* (Cooke) Aderh.) and the epidemiology of scab in Italy.]—*Agricoltura ital.*, N.S., 5, pp. 37–73, 2 pl., 9 figs., 1950. [French and English summaries.]

From 1943 onwards a study was made of the biology of the ascigerous stage of *Venturia inaequalis* and *V. pirina* on apple and pear leaves, respectively, in various parts of Italy [cf. *R.A.M.*, 25, p. 506]. After an exhaustive review of the systematic position of the genus *Venturia* the author accepts Sydow's proposal of *Endostigme cinerascens* [ibid., 24, p. 453; 28, p. 404] and *E. pirina* for the apple and pear scab pathogens, respectively, *Fusicladium pomi* instead of *F. dendriticum*, and *Megacladosporium pirinum* for *F. pirinum*. Complete descriptions of the perfect and imperfect states of both fungi are supplied. A study of ascospore development and discharge showed that emission lasted in both species from 40 to 60 days [see next abstract].

LOUW (A. J.). **The germination and longevity of spores of the Apple-scab fungus, Venturia inaequalis (Cke) Wint.**—*Sci. Bull. Dep. Agric. S. Afr.* 285, 16 pp., 3 pl., 1948. [Received December, 1950.]

In laboratory studies at the Western Province Fruit Research Station, Stellenbosch, South Africa, ascospores of *Venturia inaequalis* [*R.A.M.*, 22, p. 150; 27, pp. 326, 529, and preceding abstract] would not germinate without added water but did so readily in three hours in drops of distilled water. They became adherent to the surface on which they rested even before visible germination took place. Both ascospores and conidia germinated at temperatures ranging from 0° to 26° C., but not at 30° after 18 hours. Conidial germination was variable and consistently poorer than that of ascospores. The development of appressoria was favoured by the lower temperatures. Prolonged storage in dry air of apple leaves bearing perithecia or conidia did not impair the viability of the spores for some months, the

germination rate of ascospores after 293 days being 76 per cent. Exposure of conidia or ascospores to high humidities after their discharge reduced their longevity, while drying tended to prolong it. Moderately high temperatures (26° and 30°) impaired the viability of both types of spore. These effects are probably responsible for the variable viability of conidia under orchard conditions.

Andes (J. O.) & Keitt (G. W.). **Variability of Glomerella cingulata (Stonem.) S. & v.S. from Apples.**—*Phytopathology*, 40, 10, pp. 915–924, 1 graph, 1951.

When seven strains of *Glomerella cingulata* [*R.A.M.*, 29, pp. 157, 218] isolated from rotted apples in Arkansas, Tennessee, Washington, D.C., Illinois, and Kentucky were grown on standard media at the University of Wisconsin, Madison, only the chromogenic strains showed clear-cut morphological differences. The ascosporic pattern of segregation for 'plus' and 'minus' was generally similar in all the strains except the chromogenic, which formed no perithecia [ibid., 21, p. 145]. The strains could be distinguished by the addition of certain growth substances to purified media. No change in the 'plus' or 'minus' condition was obtained by alteration of the environment. On the basis of the available evidence the reaction of strains and types of *G. cingulata* to certain growth substances appears to be genetically controlled [cf. ibid., 25, p. 407; 29, p. 372].

Gollmick (F.). **Beobachtungen über den Apfelmehltau.** [Observations on Apple mildew.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 4, 11, pp. 205–214, 1950.

Studies of apple mildew (*Podosphaera leucotricha*) [*R.A.M.*, 24, p. 318] over a period of years at the Naumburg branch of the Central Biological Institute, Germany, under very favourable conditions for natural infections demonstrated that no apple variety is immune, although many showed a high degree of resistance. The latter (class 1) include Champagne Reinette, Danziger Kantapfel, Geheimrat Oldenburg, Red Star Reinette, White Wax Reinette, Grüner Fürstenapfel, Kaiser Wilhelm, Nimmermühr, Peasgood's Nonsuch, and Reinette aus Dippedahl. In 1949 perithecial production was extremely abundant, probably due to very dry conditions during the summer, being most numerous on one-year-old shoots and suckers, very rare on leaves, and absent on fruits. While only one-fifth of the slightly affected trees (class 2) had perithecia, they occurred on all trees with the most severe infections (class 5). It is concluded that trees with slight or medium infection and perithecia are apparently less resistant than those producing no perithecia.

Of 30 wild *Malus* species and their hybrids only *M. pumila* and its varieties and hybrids appeared very susceptible. All others had a high degree of resistance. Observations of the progeny derived from crosses between Ontario and varieties of varied susceptibility showed that reaction to *P. leucotricha* is genetically conditioned.

Cochran (L. C.). **Infection of Apple and Rose with the ring-spot virus.**—Abs. in *Phytopathology*, 40, 10, p. 964, 1950.

In the autumn of 1947 [? at the California Citrus Experiment Station], apple seedlings were budded with peach containing [peach] ring spot virus [*R.A.M.*, 21, p. 85; 26, p. 19, and next abstract] collected from different sources. In June, 1948, ring and mottle patterns resembling those of apple mosaic virus [ibid., 23, p. 391; cf. also ibid., 30, p. 167] developed on one apple seedling on the leaves adjacent to the inoculation site. After indexing all the apple seedlings by budding on peach, typical ring spot developed only from the one apple seedling showing virus symptoms. In May, 1949, rings, mottle patterns, and distorted leaves were seen on five of the seedling trees. Indexing all the apple seedlings again on peach led to the development of typical ring spot symptoms from the five apple seedlings showing virus symptoms,

but none from unbudded or symptomless seedlings. No symptoms have appeared on peach trees inoculated in October, 1949, with four sources of apple mosaic virus. Eleven standard rose varieties were indexed by budding on to peach trees, two of which developed ring spot, indicating the natural occurrence of the virus in rose.

COCHRAN (L. C.). **Passage of the ring-spot virus through Peach seeds.**—Abs. in *Phytopathology*, 40, 10, p. 964, 1950.

None of the seedlings from seeds collected [? at the California Citrus Experiment Station] from one Lovell and four Rio Oso Gem peach trees, the former experimentally and the latter naturally infected with [peach] ring spot virus developed any ring spot symptoms. All were indexed by budding one nursery tree with three buds from each seedling. Of the 15 and 14 seedlings arising from Rio Oso Gem trees showing current-season symptoms, none contracted infection. Of the 8 and 31 seedlings from Rio Oso Gems, which had shown symptoms two years earlier but now appeared healthy, and 81 from the Lovell, three of the 31 and one of the 81 were infected. Ring spot virus from the seedlings induced severe symptoms in the test trees, similar to those observed in the mother seed trees.

WEATHERS (L. G.) & COCHRAN (G. W.). **Transmission of components of the western-X virus complex to herbaceous plants.**—Abs. in *Phytopathology*, 40, 10, p. 970, 1950.

Part of the western X-virus complex [? strain of peach X-virus: *R.A.M.*, 30, p. 170], presumably the virus itself, was transmitted by means of dodder (*Cuscuta campestris* and *C. subinclusa*) from diseased peach to carrot, periwinkle [*Vinca* sp.], and parsley [? in Utah: cf. ibid, 24, p. 306]. Carrot leaves already mature at the time of infection developed anthocyanescence, while those produced later became severely stunted, chlorotic, and distorted. Infected periwinkle leaves turned yellow and curled upwards, and the flowers did not attain normal size and colour. Mature leaves of infected turnip-rooted parsley turned yellow and assumed a prostrate habit, while those in course of development became stunted, cupped, and chlorotic. Carrot, periwinkle, and parsley plants connected to healthy peach with the same species of dodder did not develop the symptoms described. Tomato plants connected to diseased peach with *C. subinclusa* in the field contracted a necrosis and wilt resembling tip blight [ibid., 22, p. 502]. However, the negative results of greenhouse transmission tests cast doubt on the transmissibility of the X-disease virus from peach to tomato.

WOLFE (H. R.), ANTHON (E. W.), & JONES (L. S.). **Transmission of western X-disease of Peaches by the leafhopper, Colladonus geminatus (Van D.).**—Abs. in *Phytopathology*, 40, 10, p. 971, 1950.

The first evidence of insect transmission of western X-disease virus [? strain of peach X-virus: see preceding abstract] was obtained in 1948 and 1949 at Wenatchee, Washington, and The Dalles, Oregon. In one series of 18 Lovell peach seedlings inoculated in the greenhouse by the leafhopper *Colladonus geminatus*, six transmissions were effected and another six trees showed suspicious symptoms, while 15 controls remained healthy. The same leafhoppers also transmitted the virus to a J. H. Hale peach tree in the field. Previous to transmission the leafhoppers fed on both infected cherry and peach. In greenhouse trials the insects fed on inoculum as nymphs and adults, but fed on the test trees only as adults. During the period of 56 days between their removal from the inoculum and their first feeding on the test trees, the leafhoppers fed on healthy trees in the field. The first symptoms on the Lovells in the greenhouse appeared 46 days after exposure to the vectors. One

adult transmitted the disease in a single feed, but up to 25 leafhoppers were used on the other test trees.

Richards (B. L.) & Wadley (B. N.). **Utah Dixie rusty mottle of Sweet Cherry.**—Abs. in *Phytopathology*, 40, 10, p. 969, 1950.

The virus responsible for Dixie rusty mottle, a limiting factor in the production of sweet cherries in Washington County, Utah [*R.A.M.*, 24, p. 324], rapidly becomes systemic in inoculated trees and gives rise to a combination of symptoms placing the disease in the rusty mottle group [ibid., 29, p. 313]. The incubation period in both greenhouse and field may not exceed four to six weeks. In 1949 an apparently related disease was observed to be generally distributed among peaches growing near infected cherry. Subsequent inoculations on sweet cherry with the virus from naturally infected peach induced rusty mottle symptoms in cherry. The virus has been transmitted by bud and chip grafts to mazzard cherry and the Bing, Lambert, Napoleon, and Black Tartarian sweet varieties, as well as to sour cherry and several peach varieties.

Berkeley (G. H.). **Mild rugose mosaic of Sweet Cherry.**—*Phytopathology*, 40, 11, pp. 992–998, 2 figs., 1950.

In August, 1942, the leaves of two Black Tartarian sweet cherry trees growing near Grimsby, Ontario, were affected with a mild, rugose-type mosaic, characterized by a distinct, dull green mottle with chlorotic spots and rings. The unfolding leaves of Black Tartarian and Napoleon, budded with infected material, developed each year chlorotic mottling, and in subsequent years the leaves were distorted and stunted. Chlorosis occurred as spots, rings, bands, and patterns. Symptom expression on individual leaves varied greatly.

On peach seedlings, budded from the original trees, there was a delay in foliation, spot mottling of leaves, reduction in leaf size, and mild bark roughening and splitting. This last symptom was especially pronounced on Elberta and Rochester peach trees inoculated from the seedlings. On Montmorency sour cherry there was delayed foliation, distortion of unfolding leaves, and chlorotic spots, rings, and bands. No visible symptoms were induced on Italian prune or Lombard plum.

The disease is of a virus nature, is new to Ontario, and appears to be undescribed. It is of no economic importance at present, but constitutes a potential danger.

Nicolini (J. C.). **Tuberculosis del Olivo.** [Olive knot.]—*Inf. Direcc. Invest. agríc., B. Aires*, 3, 28–29, pp. 14–15, 1 map, 1950.

Olive knot (*Pseudomonas savastanoi*) [C.M.I. map No. 135] is a serious economic problem in Entre Ríos, Corrientes, Buenos Aires, and other parts of Argentina. Information on the geographical distribution, symptomatology, and control of the disease is summarized. Bacteriological studies are in progress with a view to the establishment of quarantines for nursery plants (the principal source of spread of the disease) in the different zones of olive cultivation. The duration of the incubation period of *P. savastanoi* was found to be upwards of 30 days.

Zentmyer (G. A.), Snyder (W. C.), & Hansen (H. N.). **Use of natural media for inducing sporulation in fungi.**—Abs. in *Phytopathology*, 40, 10, p. 971, 1950.

The use in water of small avocado roots sterilized with propylene oxide [*R.A.M.*, 26, pp. 461, 554] led to abundant oospore production in five days by *Phytophthora cinnamomi* [ibid., 27, pp. 31, 483]. The production of both antheridia and oogonia in cultures from single hyphal tips demonstrated that the strains tested are homothallic and hermaphrodite.

Adsuar (J.). **Studies on virus diseases of Papaya (Carica papaya) in Puerto Rico. I. Transmission of Papaya mosaic. II. Transmission of Papaya mosaic by the green Citrus aphid (Aphis spiraecola Patch). III. Property studies of Papaya mosaic virus.**—*J. Agric. P.R.*, 31, 3, pp. 248–256, 257–259, 260–264, 6 figs., 1947. [Spanish summaries. Received November, 1950.]

These papers have already been noticed from another source [*R.A.M.*, 26, p. 458].

Menon (H. B.). **El cultivo del Guayabo.** [Guava cultivation.]—*Agricultor venez.*, 15, 145, pp. 43–47, 1950.

The leaves and fruits of guava trees (*Psidium guajava*) growing under humid conditions in Venezuela are subject to spotting by *Cephaleuros virescens* [*C. mycoidea*: *R.A.M.*, 29, p. 320]. The disease is controlled by spraying the leaves every three or four weeks with a mixture consisting of 1½ lb. cuprocide, 1½ lb. hydrated lime, and 3 lb. zinc sulphate to 100 gals. water [cf. ibid., 20, p. 172].

The leaves, fruits, and branches of trees affected by rust [*Puccinia psidii*: ibid., 25, p. 235 and C.M.I. map No. 181] should be burnt to limit the spread of the disease. If the trees are in bud they should be sprayed with 1–1–100 Bordeaux mixture, the treatment being repeated every four weeks where necessary.

Deficiency chlorosis, occurring on highly alkaline soils or those low in iron or zinc may be alleviated either by correcting the soil alkalinity or by spraying with nutrient solutions containing the required elements.

Grosser (Annemarie) & Friedrich (W.). **Eine Testmethode zur Bestimmung von Pilzhemmstoffen.** [A test method for the estimation of fungistatic substances.] —*Z. Naturf.*, 2b, 11–12, pp. 425–427, 2 figs., 1947. [Abs. in *Biol. Abstr.*, 23, 5, p. 1721, 1949.]

The following rapid and accurate method was developed for testing the activity and optimum concentration of fungistatic or fungicidal agents. Petri dishes containing various concentrations of the test substances and a phosphate buffer were inoculated with streaks from a three- to five-day-old culture of *Rhizoctonia* [*Corticium*] *solani* and allowed to stand for six hours at 26° C. During this period hyphae 3 to 5 mm. long are formed in phosphate solution alone, but no visible growth occurs where there is inhibition.

Leben (C.) & Keitt (G. W.). **A bioassay for tetramethylthiuramdisulphide.**—*Phytopathology*, 40, 10, pp. 950–954, 1 graph, 1950.

An agar plate diffusion assay, using *Glomerella cingulata* as the test organism, is described for thiram [*R.A.M.*, 29, p. 221; 30, p. 177] and arasan SF, the active ingredient of which is thiram [ibid., 28, p. 307; 29, pp. 268, 549, *et passim*]. The composition of the medium and the method of seeding the Petri dishes are the same as described for the assay of antimycin [ibid., 28, p. 635]. By means of this procedure, the amounts of thiram in the first, second, and third ethanol extracts from 20-gm. samples of maize seed treated with arasan SF were calculated. In each of four lots examined less than 1 per cent. of the original quantity remained on the seeds after three extractions. More than half the 46 lots of untreated seed carried detectable amounts of thiram, as determined by the inhibition zones round grain in agar seeded with *G. cingulata*. In the lots showing activity, from 0·04 to 0·4 μgm. of thiram per seed was estimated to be present, presumably as a result of contamination through handling or from the air in the seed houses.

Seeds treated with arasan SF in excess of the recommended dosage of 0·5 oz. per bush. inhibit the growth of *G. cingulata* over the whole plate, and for high concentrations, therefore, it is advisable to substitute *Helminthosporium victoriae*, with which clear-cut inhibition zones 40 to 50 mm. in diameter are formed on potato dextrose agar.

Wenzl (H.) & Kahl (E.). **Benetzungsfähigkeit und Oberflächenspannung.** [Wetting ability and surface tension.]—*PflSchBer., Wien*, 5, 3–4, pp. 258–267, 3 graphs, 1950.

The authors' experimental results corroborated those of previous workers in respect of the inapplicability of surface tension values in the assessment of the spreading of plant-protectives [cf. *R.A.M.*, 29, p. 574 and next abstract], for which the spraying method was found to be superior to dipping. From comparisons of (*a*) different spreaders in the same medium (tap or distilled water), (*b*) the same spreader in distilled and tap water, and (*c*) soft soap solutions of different concentrations, it may be concluded that no simple correlations exists between the dosage sufficient to produce thorough coverage of the leaf and the surface tension value.

Ramsfjell (T.). **Spreiemidler. Wetters, spreaders and stickers.**—7 pp., 3 pl., 1 fig., Oslo, Gjærders Trykkeri, 1950.

The wetting, spreading, and sticking properties of 10 spray adjuvants were determined in laboratory experiments. The shape of the spray droplets on a non-wettable surface represents the various degrees of wetting, corresponding to differences in surface tension [cf. preceding abstract]. Of the various spreaders and stickers applied to slides and apple leaves in conjunction with a pure sulphur preparation, 2 per cent. sulfuron X, the most tenacious were triton [*R.A.M.*, 25, p. 201; 26, pp. 109, 311, 477] and sandovit [ibid., 21, p. 341; 29, p. 60].

Sobels (Johanna C.). **Nutrition de quelques Myxomycètes en cultures pures et associées et leurs propriétés antibiotiques.** [The nutrition of some Myxomycetes in pure and mixed cultures and their antibiotic properties.]—135 pp., 16 figs., 2 diags., Gouda, Koch & Knuttel, 1950. [English summary.]

This extensive study of the nutrition of myxomycete plasmodia in culture, carried out in Holland and France from 1940 to 1948, is based on the work of Cohen (*Bot. Gaz.*, 101, pp. 243–275, 1939; 103, pp. 205–224, 1941). It was found that some plasmodia are easily grown in pure culture and retain their orange-yellow pigmentation under all conditions. Others, presumed parasitic, cannot be maintained in pure culture and tend to lose their colour, but in mixed cultures they grow well and regain their colour. A particular study was made of the growth of *Licea flexuosa* in pure culture and in association with *Torulopsis laurentii*. The plasmodia exerted an inhibitory or lytic action on the growth of bacteria, yeasts, *Cladosporium herbarum*, and *Penicillium* sp. A bibliography of 94 titles is appended.

Hillier (J.). **Electron microscopy of microorganisms and viruses.**—*Ann. Rev. Microbiol.*, 4, pp. 1–20, 1950.

From a review of the literature (151 titles) published from 1940 to December, 1949, the author attempts to define the present range of application of the electron microscope in microbiology and to indicate those contributions which fall within it. The paper also reviews work on techniques of specimen preparation, bacterial structure, and viruses.

Tatum (E. L.) & Perkins (D. D.). **Genetics of microorganisms.**—*Ann. Rev. Microbiol.*, 4, pp. 129–150, 1950.

The authors review the literature, mostly from January, 1949, to February, 1950, dealing with the genetics of microorganisms (265 titles cited) [cf. *R.A.M.*, 28, p. 298; 30, p. 55], the subject-matter comprising the mechanism of variation, gene mutation, genetic change in populations, the mechanism of transmission and genetic recombination, biochemical genetics, and genetics and evolution.

Muller (C. J.). **Better seeds for the horticultural industry.**—*J. Minist. Agric.*, 57, 9, pp. 426–429, 1950.

Brief recommendations are made to seed growers for the avoidance of pests and diseases. Rotations should be as long as possible; all materials and implements should be absolutely clean; infected plants and plant residues after harvest should be promptly removed; careful weed control should be practised; and every care should be taken in stacking and storing harvested material.

Glasscock (H. H.). **Good control of plant diseases.**—180 pp., 23 figs., London, The English Universities Press Ltd., 1950. 4*s.* 6*d.*

This book is one of the 'Teach Yourself Farming' series and deals with diseases of potatoes, cereals, fruit, tomatoes, and vegetables. There are also chapters on fungicides, control, and nutritional disorders.

Parker-Rhodes (A. F.). **Fungi, friends and foes.**—140 pp., 47 figs., 2 diags., London, Paul Elek Publishers Ltd., 1950. 12*s.* 6*d.*

An outline of the fungi is given in simple terms with reference to life-histories, parasitism, decay of wood and fibres, edibility, industrial uses, and classification.

Carrera (C. J. M.). **Medios líquidos para la conservación de materiales fitopatológicos y de frutas para el Museo Carpológico.** [Liquid media for the preservation of phytopathological specimens and fruits intended for the Carpological Museum.]—Reprinted from *Bol. Fac. agron. vet., B. Aires*, 18 pp., 1950. [English summary.]

Chemical formulae are given of a number of liquid media for the preservation of phytopathological specimens for purposes of exhibition, teaching, and identification.

Herrell (W. E.). **Newer antibiotics.**—*Ann. Rev. Microbiol.*, 4, pp. 101–128, 1950.

This review of the literature (235 titles) on the newer antibiotics of microbial origin covers the period from January, 1949, to February, 1950, and deals with the activity, reactions, and pharmacological and clinical aspects of penicillin [*R.A.M.*, 30, p. 184], streptomycin [ibid., 29, p. 270], aureomycin [ibid., 29, p. 146], chloramphenol (chloromycetin) [loc. cit.], terramycin (elaborated by a strain of *Streptomyces rimosus*), bacitracin [ibid., 29, p. 271], polymyxin [loc. cit.], and miscellaneous antibiotics not important enough as yet to justify detailed consideration. Among these last is 'antibiotic XG' (*J. clin. Invest.*, 28, pp. 927–933, 1949) which is stated to show a remarkable ability to inhibit the growth of many pathogenic fungi, being both fungistatic and fungicidal. Produced during the growth of a bacterium apparently closely related to *Bacillus subtilis* [*R.A.M.*, 30, p. 59], it is a strongly haemolytic compound *in vitro*, but is reported to have shown considerable promise (in preliminary trials) as a topical agent in the treatment of certain fungus infections.

Weindling (R.), Katznelson (H.), & Beale (Helen P.). **Antibiosis in relation to plant diseases.**—*Ann. Rev. Microbiol.*, 4, pp. 247–260, 1950.

The authors discuss (with 108 references to the literature) antibiosis and antibiotics in relation to plant pathogens and disease control [cf. *R.A.M.*, 25, pp. 318, 358; 28, pp. 138, 320; 30, p. 184], the points dealt with comprising pathogens affected by antibiotic micro-organisms; the control of obligate parasites, seed- and soil-borne diseases, and bacterial diseases by exploiting antibiosis; and antibiotic substances in relation to plant diseases and virus diseases [ibid., 30, p. 98].

Stahl (W. H.), McQue (B.), Mandels (G. R.), & Siu (R. G. H.). **Studies on the microbiological degradation of wool. Digestion of normal and modified fibrillar proteins.**—*Text. Res. J.*, 20, 8, pp. 570–579, 1 fig., 3 graphs, 1950.

Measurements of the susceptibility of various keratins and fibrillar proteins, both normal and modified, to digestion by the keratinolytic fungus, *Microsporum gypseum* [*R.A.M.*, 29, p. 375], were made at the Quartermaster General Laboratories, Philadelphia, Pennsylvania. The digestibility of the substances tested was in the following descending order: collagen, feather, hoof, wool, horn, horsehair, mohair, and silk. A good correlation was established between the digestibility of keratins by *M. gypseum* and their degree of dispersibility after reduction in neutral solutions of protein denaturants.

The optimum pH for the breakdown of wool by the fungus, judged by loss of breaking strength, is between 7 and 7·5, with limits at 3·6 and 8·5.

The chemical composition and molecular architecture of the fibrillar proteins were found to be the primary factors determining their digestibility. With keratins, the higher the degree of polymerization, attributed primarily to the disulphide cross-linkages, the greater is their resistance to digestion. Partial substitution of an alkyl group into the disulphide cross-linkage does not immunize the fabric against microbiological infection. Keratin-detergent-complex, however, is resistant to digestion.

Goll (M.) & Coffey (G.). **Mildew of painted surfaces.**—Reprinted from *Paint Oil Chem. Rev.*, 3 pp., 11 figs., August, 1948. [Received December, 1950.]

Extensive studies over a period of three years were carried out in the United States on the fungal flora involved in the mildewing of paint surfaces. In the majority of cases of mildew grey to black discolorations were evident, due almost entirely to species of *Pullularia* [*R.A.M.*, 30, p. 61], the most common agent on both exterior and interior pigmented coatings, penetrating quite deeply in the paint film. Of the other fungi isolated species of *Alternaria*, *Trichothecium*, and *Spicaria* were responsible for mildew of paints in food appliances, species of *Cephalosporium* and *Cylindrocephalum* in breweries and distilleries, and species of *Stemphylium* in textile mills. Species of *Aspergillus* and *Penicillium* were only secondary contaminants.

Shterenberg (P. M.). **Mikoriza drevesnoy rastitel'nosti v stepi.** [Mycorrhiza of the woody vegetation of the steppe.]—*Agrobiology, 1949*, 6, pp. 149–152, 1949. [Abs. in *For. Abstr.*, 12, 2, p. 148, 1950.]

Examination from April to May and again in September of the roots of woody species growing in the vicinity of Odessa showed that oak, pine, and spruce had mycorrhiza and no root hairs. Lime (*Tilia* sp.), birch (*Betula pubescens*), poplar (*Populus nigra* and its var. *italica*), and *Acer pseudoplatanus* had both. *Robinia pseudo-acacia* and *Amorpha* sp. had root nodules and root hairs. *Elaeagnus* sp. had mycodomatia and root hairs. No symbionts were found on *Acer campestre*, almond, medlar, walnut, ash, elm, or fruit trees in general [cf. *R.A.M.*, 30, p. 234].

Well-developed oak mycorrhiza were found when the soil pH was 6·5 to 6·8 under the roots. In experimental sowings of oak by the 'nest' method mycorrhiza began to develop in August, and were well-developed by the end of September; seedlings without were mostly shorter and had few leaves, which were sometimes pale.

Abundant mycorrhiza develop in the spring and autumn periods of active root growth, as only young root tips become enveloped by the hyphae. Root growth is affected by assimilation and when this is reduced, as in etiolated leaves, decreased root growth results and decreased infection by mycorrhiza. For intercropping in

shelterbelt plantations care should be taken to use plants that will not overshade tree seedlings and to sow cereals not subject to lodging.

WINTER (A. G.). **Zur Verbreitung und Bedeutung der Mykorrhiza bei landwirtschaftlichen Kulturpflanzen.** [On the distribution and importance of mycorrhiza in agricultural cultivated plants.]—*Naturwissenschaften*, 37, 23, pp. 542–543, 2 figs., 1950.

Endotrophic arbuscular mycorrhiza were widespread on oats, rye, wheat [*R.A.M.*, 29, p. 273], barley, maize, and clover, and numerous weeds belonging to the Gramineae and Compositae in the author's studies at the University of Bonn [cf. ibid., 30, p. 223]. The extent of fungal infestation may involve up to 90 per cent. of the finer roots. Infection takes place through the root hairs, as in oats, the epidermis (maize), or in the other plants investigated predominantly through the latter and only occasionally through the former. The bulk of the mycelium is situated in the cells bordering the endodermis, the entire parenchyma being irregularly permeated only in maize. Infection right up to the root tip is frequent but root hair development never suffers [see preceding abstract]. The mycelium in maize forms few or no more septa once the roots are penetrated. In oats both septate and non-septate hyphae are present, while in the other plants the mycelium was consistently non-septate. The mycorrhizal fungi are polyphagous and widely distributed. It is not the quality of the soil but the permanent presence of susceptible hosts that is decisive in mycorrhizal formation. Heavy infestation is frequently associated with poor development.

Studies by the author's pupil, E. Sievers, revealed no mycorrhiza in potatoes [ibid., 26, p. 261] either in cultivated ground treated with a variety of fertilizers or on virgin soils newly brought into cultivation. Only in one case could mycorrhiza be detected in a few fine suckers. On the other hand, onion, leek, and garlic consistently harboured endotrophic mycorrhiza in all kinds of cultivated soils. The septate mycelium is apparently identical with that found in maize, but the external mycelium is better developed. In *Colchicum autumnale* the link with the soil is so much stronger that the fungus might well participate in the nutrition of the host by increasing the uptake of mineral salts, as suggested by Stahl (*Jb. Bot.*, 24, p. 534, 1900) [cf. above, p. 239].

WOOLLEY (D. W.). **Studies on the structure of lycomarasmin.**—*J. biol. Chem.*, 176, 3, pp. 1291–1298, 1948.

WOOLLEY (D. W.). **Synthesis and determination of lycomarasmin activity of some derivatives of aspartic acid.**—ibid., 176, 3, pp. 1299–1308, 1948. [Abs. in *Biol. Abstr.* 23, 5, p. 1720, 1949.]

Details are given of the structure of lycomarasmin [*R.A.M.*, 30, p. 84] from culture filtrates of *Fusarium* [*bulbigenum* var.] *lycopersici*. It is a peptide-like toxin derived from asparagine. In studies at the Rockefeller Institute for Medical Research, New York City, on the synthesis and determination of the ability of several new derivatives of asparagine and aspartic acid to induce wilting in excised tomato leaves, one product was obtained which was equal to the natural toxin in this respect.

OSWALD (J. W.). **A strain of the Alfalfa-mosaic virus causing vine and tuber necrosis in Potato.**—*Phytopathology*, 40, 11, pp. 973–991, 4 figs., 1950.

In 1946 White Rose potato plants growing near Stockton, California, adjacent to a lucerne planting were affected by a destructive disease, tuber necrosis, caused by a strain of lucerne mosaic virus [*R.A.M.*, 19, p. 563]. The symptoms differed markedly from those of potato calico, also caused by a strain of lucerne mosaic virus, which occurred simultaneously in some plants.

Current-season field infection is characterized by rugosity and necrosis of the

upper leaves, with internal necrosis of the veins, petioles, and main shoots, gradually progressing throughout the plant and into the tubers. Growing tips are blighted and plants usually killed prematurely. In the tuber, necrosis starts just under the skin near the stolon and later extends throughout, often as pockets or in rings or spirals. The necrotic tissues are corky, dry, and dark brown and the tuber surface over affected areas becomes sunken and cracked. Usually all the tubers produced on killed plants are affected. Necrosis is commonly present at harvest, causing yield reductions, and it often spreads and becomes more serious in storage. Second-generation symptoms are mostly more severe. When all the eyes are necrotic, infected tubers either fail to sprout or produce weak, diseased plants.

Nine inoculated potato varieties and 13 seedling lines tested all proved susceptible and all the varieties except Sequoia and Red Warba developed necrotic tubers. The U.S.D.A. seedling 41956 (immune from virus X) proved very susceptible and was used as a virus source for all tests. The virus is tuber-perpetuated and readily transmitted by juice inoculation, grafting, and by *Myzus persicae*. From plants showing symptoms of both potato calico and tuber necrosis both strains of the virus could be recovered separately. Potato calico disease is characterized by yellow chlorotic blotching of the leaves and no tuber necrosis. Both viruses when inoculated into lucerne each induced symptoms like lucerne mosaic. A systemic leaf mottle was produced by each on chilli, *Datura stramonium*, cucumber, and celery. Neither infected tomato. On Turkish tobacco, *Nicotiana glutinosa*, and *N. rustica* the tuber necrosis virus caused ring patterns, striations, and other leaf patterns, while the potato calico virus induced a bright yellow mosaic with green vein-banding. Local lesions are the main effect of both viruses on Bountiful bean [*Phaseolus vulgaris*] and cowpea.

The thermal inactivation point of both viruses is 55° C., and their longevity *in vitro* at 16° three to four days [ibid., 21, p. 513]. In cross protection tests the potato calico strain protected potato plants against infection with the tuber necrosis strain. Simultaneous inoculation of potato with both viruses using juice containing approximately equal amounts of each resulted in infection with both. Both viruses were recovered from lucerne plants with natural infections of typical mosaic and transmitted to potato. A virus similar to the tuber necrosis virus was recovered from infected Ladino clover [cf. ibid., 29, p. 29]. The reaction produced on various inoculated hosts was similar to, but not identical with that caused by the tuber necrosis strain.

It is suggested that the tuber necrosis virus may be a mutant of the calico strain. The importance of the virus is minimized by the fact that it spreads only from infected lucerne, and that it is virtually self-eliminating from the standpoint of tuber perpetuation.

Bercks (R.). **Infektionsversuche mit verschiedenen X-Virusherkünften an mehreren Kartoffelsorten.** [Inoculation experiments with different X-virus strains on several Potato varieties.]—*Züchter*, 20, 9–10, pp. 282–287, 1950.

Further information is presented on the author's field and greenhouse inoculation experiments with Cs 35 and other strains of potato virus X on the potato varieties Flava [*R.A.M.*, 29, p. 425], Frühmolle, Frühbote, Primula, Frühperle, Oberarnbacher Frühe, Mittelfrühe, Capella, and Cornelia. The only one attacked with any degree of severity by Cs 35 was Frühperle. On the other hand, virus X from Flava was pathogenic to all the varieties. Out of four varieties tested with X from Erstling [Duke of York], Flava and Cornelia were extensively infected, whereas Mittelfrühe and Capella remained immune. Kaiserkrone-X was tested on Capella only with negative results and Sabina-X on Flava only, which reacted positively. The immunity from infection acquired by all the varieties with advancing age was preceded in Flava by a transitional stage in which Flava-X and Duke of York-X

were able to penetrate the inoculated sprouts but not to migrate to the rest of the shoots.

DAVIES (A. J.). **Seed Potato production in Wales.**—*J. Minist. Agric.*, 57, 9, pp. 420–426, 1950.

The author reviews the development, organization, and present status of seed potato production in Wales, which was started after a survey carried out in the northern area in 1921, when the incidence of leaf roll in home-saved seed was found to be an important factor contributing to low yields [cf. *R.A.M.*, 3, pp. 416, 736; 7, p. 736; 9, p. 738; 11, pp. 200, 318, 319; 20, p. 131; 28, p. 303]. It still remains, probably, the most difficult problem in maintaining the health of stocks, and investigations are in progress to obtain more information regarding the climate and aphid population in the seed potato areas.

Growers are strongly advised to spray with sulphuric acid (a 12 per cent. solution is generally used) before lifting to check blight [*Phytophthora infestans*] and facilitate early lifting. Although the best growers have mastered the technique of roguing, some do not give enough time to this operation, but where reasonable attention has been paid stocks have maintained their health for three or four years.

HEY (A.). **Über die Verbreitung des Kartoffelkrebserregers (Synchytrium endobioticum (Schilb.) Perc.) in den Ländern der Deutschen Demokratischen Republik.** [On the distribution of the agent of Potato wart disease (*Synchytrium endobioticum* (Schilb.) Perc.) in the provinces of the German Democratic Republic.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 4, 5–6, pp. 93–96, 2 graphs, 2 maps, 1950.

The extensive use of potato varieties resistant to wart (*Synchytrium endobioticum*) [*R.A.M.*, 29, p. 51; 30, pp. 189, 242] is responsible for the relatively low incidence of the disease in the German Democratic Republic. In 1950 the numbers of infected localities in the provinces Sachsen, Brandenburg (including Berlin), Mecklenburg, Sachsen-Anhalt, and Thüringen were 821, 818, 460, 362, and 343, respectively. Twenty-five resistant varieties have recently been released for increasing, including Toni (1946), Hilla and Immertreu (1947), and Leona, Sirius, and Wega (1950).

HOOKER (W. J.) & KENT (G. C.). **Sulphur and certain soil amendments for Potato scab control in the peat soils of northern Iowa.**—*Amer. Potato J.*, 27, 10, pp. 343–365, 1 fig., 3 graphs, 1950.

Most of this information on the soil treatments used in northern Iowa since 1941 for the control of potato scab (*Streptomyces* [*Actinomyces*] *scabies* [*R.A.M.*, 30, p. 72]) has already been noticed [ibid., 28, p. 117 *et passim*]. At Crystal Lake, 4,000 lb. sulphur per acre were required for commercial control while at Clear Lake 2,000 lb. were effective. At both locations there was a marked reduction in both russet and deep scab as the pH increased. Sulphur worked into the furrow was required in smaller amounts than in broadcast applications to give equal control. The effectiveness of furrow application depended on the thoroughness with which the sulphur was mixed with the soil. When applied by this method ammonium sulphate was approximately equal to sulphur in controlling scab. Excessive sulphur applications or insufficient mixing with the soil caused russeting of the tuber surface and, in severe cases, a crumbly rot of the underlying tissues. Yields of Cobbler potatoes at Crystal Lake were increased by 40 to 50 bush. per acre by broadcast applications of one or more tons of sulphur per acre. The greatest yield responses, following treatment with 500 lb. sulphur per acre worked into the furrow, were obtained with Cobbler, Pawnee, Red Warba, Triumph, and Katahdin, and the

resistant varieties Russet Burbank and 116–13. A leaf roll symptom present in many seed lots was partly alleviated by sulphur applied in the furrow.

FRIEDMAN (B. A.). **Behavior of Potato internal brown spot in stored tubers.**—*Phytopathology*, 40, 10, pp. 899–901, 1 fig., 1950.

The prevalence of internal brown spot (probably the same condition as physiological internal necrosis) [*R.A.M.*, 29, p. 376] in late-crop Long Island potatoes in 1948 afforded an opportunity to determine whether the presence of the disorder in stored tubers predisposed them to decay. On 8th October eight bags of Green Mountain tubers with 20 per cent. internal brown spot were stored at the Division of Fruit and Vegetable Crops and Diseases, U.S. Department of Agriculture, New York, at an average temperature of 49° F. and relative humidity of 67 per cent.; four bags were examined at the end of 80 days and the remainder after 143, when the percentages of decay (caused by *Fusarium* spp.) were estimated at 2 and 2·2, respectively. The average incidence of infection in the affected and sound tubers was 0·7 and 2·6 per cent., respectively. It seems unlikely, therefore, that the occurrence of internal brown spot is conducive to the rotting of potato tubers.

SMITH (W. L.). **Pathogenic differences manifested by Erwinia atroseptica and Erwinia carotovora.**—*Phytopathology*, 40, 11, pp. 1011–1017, 1950.

In further work [cf. *R.A.M.*, 29, p. 276] at Cornell University, New York, the pathogenic reactions of isolates of *Erwinia atroseptica* and *E. carotovora* [ibid., 29, p. 502] on inoculated Sebago potato plants were studied. The plants, about 1 ft. high, were inoculated by removing the terminal bud and inverting agar blocks bearing the bacteria on to the freshly cut surfaces. All the isolates tested caused varying amounts of rotting and blackening at the stem apex, those inducing blackleg at the base of the stem in general causing more rotting at the apex than the non-blackleg isolates. *E. atroseptica* produced also more pronounced epinasty of the leaf petioles. In the separation of these soft rot isolates into two species, a close positive correlation exists between their biochemical reactions and the pathological reactions previously reported.

VOLLEMA (J. S.). **Meeldauw bij Rubber.** [Rubber mildew.]—*Bergcultures*, 19, 12, p. 243, 1950.

After the close of the second world war many Indonesian *Hevea* rubber plantations, especially at high elevations, were found to have been ravaged by mildew [*Oidium heveae*: see above, p. 263], the annual losses from which in severe cases may amount to about a quarter of the crop. Until recently control measures could only be practised on very few estates owing to the shortage of motor-dusters and sulphur [*R.A.M.*, 30, p. 192], but now that both can again be imported large-scale operations may be undertaken. Advantage is taken of this opportunity to present an abridged version of Pfältzer's instructions (based on a lengthy pre-war experience) for the control of the disease by sulphur dusting [ibid., 21, p. 220].

FOCAN (A.), KUCZAROW (W.), & LAUDELOUT (H.). **L'influence de l'incinération sur l'incidence des maladies radiculaires. (Observations préliminaires.)** [The influence of burning on the incidence of root diseases. (Preliminary observations.)]—*Bull. agric. Congo belge*, 41, 4, pp. 921–924, 1950. [Flemish summary.]

In a preliminary experiment carried out on sandy-clay soil at Yangambi, Belgian Congo, the properties of burned-over areas (stationary and running fire) were compared with non-burned [cf. *R.A.M.*, 29, p. 383] in connection with the incidence of *Fomes* and *Armillaria* [ibid., 29, p. 292]. It was found that the

microflora immediately increased after burning, particularly the bacterial population. Increase in the microflora was due chiefly to increase in *Penicillium* spp., which comprised 95 per cent. of the fungi isolated. This observation was confirmed on several occasions in other soils. The marked reduction in numbers of *Trichoderma* spp. appeared to be due to an ecological character of the genus, the development of which is related to adequate humidity and aeration of the substrate. The increased incidence of [unspecified] root diseases among perennial plants established after burning is no doubt due to this modification in the composition of the microflora, as the genus *Trichoderma* is an important source of active antibiotics [ibid., 29, pp. 546, 595]. An identical relationship was noted at Bambesa between cotton 'wilt' [*Fusarium vasinfectum*: ibid., 26, pp. 235, 244] and dominance or regression of *Trichoderma* in the soil.

Allen (M. W.) & Raski (D. J.). **The effect of soil type on the dispersion of soil fumigants.**—*Phytopathology*, 40, 11, pp. 1043–1053, 1950.

The results of preliminary laboratory investigations carried out at the University of California, Berkeley, demonstrated that D–D mixture (1,3 dichloropropene + 1,2-dichloropropane) [*R.A.M.*, 29, p. 558] applied in cans of soil at the rate of 2·15 ml. at a single injection point was effective (as determined by percentage kill of soil nematodes) at least 8 in. laterally and 12 in. below the point of injection in sandy-loam soils. In these and other soil types the fumigant was least effective in samples at 3 in. below the surface. In soils having a relatively high moisture equivalent the lateral and vertical movement of the fumigant was reduced. The dispersal of a given dosage of D–D mixture, which appears to be unable to diffuse through clay soils or those high in organic matter, is about 100 per cent. more effective in light Fresno sandy loam than in Bowers clay or Egbert organic loam. Soils which were about intermediate in moisture equivalent between Fresno sandy loam and Yolo clay were about intermediate in their permeability to the fumigant, as indicated by the nematode kills obtained.

Winter (G.). **Untersuchungen über die Ökologie von Rhizoctonia solani im natürlichen Boden.** [Studies on the ecology of *Rhizoctonia solani* in natural soil.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), 2, 1, pp. 8–9, 1950.

In further investigations on the growth of 25 fungi in natural soils only two reacted to doses of various nutrients by increased development [cf. *R.A.M.*, 4, p. 240 and above, p. 283], the spread of the remaining species being impeded by adverse conditions of antibiotic or unknown origin.

In view of the conflicting statements in the relevant literature it seemed important, especially on practical grounds, to elucidate the mode of saprophytic development of *Rhizoctonia* [*Corticium*] *solani* in natural (garden) soil. The behaviour of the fungus differed in every respect from that of all others hitherto investigated. It grew so profusely from three pieces of inoculum, each 6 mm. in diameter, on slides that the whole mass of soil on the upper surface was like baked bread. Similar luxuriant growth occurred in a mixture of natural and partially sterilized garden soil, or natural or partially sterilized compost alone or enriched with biomalt, peptone, glucose, maize meal emulsion, or horse dung extract at concentrations of 0·125 to 2 per cent. (calculated on the water content of the soil). The growth of *C. solani*, therefore, is to a large extent independent of the properties of the soil, and the radiating hyphae absorbed no nutrients from the substratum nor were they unfavourably influenced by any inhibitory substances. The growth of the fungus appears to be made entirely at the expense of the nutrient reserve in the inoculum (14-day biomalt agar culture). Equally abundant development arose from inocula in pure sand moistened only with tap water. Mycelial growth was related to the size of the inoculum; the smaller the former, the shorter

and fewer are the emergent hyphae, until at about 1 cu. mm. only single ones can be detected. Since the nutrients supplied in sterilized culture were selected to provide optimal conditions for the growth of the pathogen, its incapacity to develop to any extent from small pieces of inoculum must have been due to the presence in the soil of special properties inhibiting the assimilation of foodstuffs from the organic constituents of the medium. *C. solani*, therefore, can develop as a saprophyte only from plant tissues which it has already permeated by parasitization. From an infected potato shoot or a rhizome, for instance, the pathogen can grow through the soil to a depth of 30 to 40 cm. and contaminate it with sclerotia, from which, however, only a few slender hyphae proceed.

Thus, from the standpoint of practical control, the sclerotia on the tubers and in the immediate vicinity of the seedlings are the only sources of infection to be considered, unless further experiments should prove the mycelium to be capable of development in the rhizosphere of non-susceptible plants [ibid., 29, p. 409]. Tuber and plant hole disinfection, therefore, should confer adequate protection, at any rate in the early stages of growth.

Bronsart (H. v.). **Der heutige Stand unseres Wissens von der Bodenmüdigkeit.** [The present status of our knowledge of soil exhaustion.]—*Z. PflErnähr., Düng.*, 45, 1–3, pp. 166–193, 6 figs., 3 graphs, 1949.

This is a fully documented survey and discussion of the literature on the various theories adduced in explanation of the 'soil exhaustion' phenomenon, viz., toxins, micro-organisms, physical degeneration, and impoverishment, supplemented by a summary of the author's experimental studies at the Wiesloch-Heidelberg branch of the Biological Institute on the mobilization of trace elements by soil treatment with carbon disulphide (a full account of which appeared in *Gartenbauforschung*, 1, pp. 20–34, 1948).

Yarwood (C. E.). **Spraying upper vs. lower leaf surface in control of Hop mildew.**—Abs. in *Phytopathology*, 40, 10, p. 971, 1950.

Hop leaves sprayed on their upper surfaces with Bordeaux mixture and inoculated on the lower surface by the application of a sporangial suspension of *Pseudoperonospora humuli* [*R.A.M.*, 21, p. 391] contracted severe infection. Leaves sprayed on their upper surfaces with Bordeaux, basicop, spergon, and zineb and subjected to natural infection remained almost free from mildew, while the unsprayed were heavily attacked. Leaves sprayed only on the lower surface were free from natural or artificial infection. Inoculation of the upper surface was usually unsuccessful even on unsprayed leaves. Spores trapped in the field were caught mostly on the upper surface of horizontal glass slides. These observations indicate that tests of fungicides in which spore suspensions of *P. humuli* are applied to the lower leaf surface may give misleading results, and that in the process of natural infection, whereby the spores are deposited on the lower surface by splashing rain, the latter may also carry to these spores some of the fungicide originally deposited on the upper surface.

Steenland (A.) & Burke (E.). **Typhula species pathogenic on Mint.**—*Plant Dis. Reptr*, 34, 10, p. 322, 1950. [Multilithed.]

In March, [1950], peppermint plants growing in very moist soil on Grand Island, Oregon, were affected by a root rot, caused by *Typhula? itoana* [*R.A.M.*, 30, p. 124 and above, p. 274]. The diseased plants were spindly and the lower leaves yellow; the roots had dark brown lesions with a hardened outer surface and soft, watery centres. The fungus was reisolated from healthy plants inoculated in the greenhouse with sclerotia and mycelium of the isolate, which produced no fructifications.